

**INTERSTATE 75 AND STATE ROAD 884 (COLONIAL BOULEVARD)
INTERCHANGE**

LEE COUNTY, FLORIDA

**INTERCHANGE
MODIFICATION REPORT**

Prepared for:

Florida Department of Transportation – District One



July 2017

Interchange Modification Report (IMR)


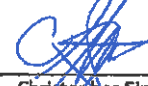




I-75 and SR 884 (Colonial Blvd.) Interchange

Financial Project Number 413065-1-32-01

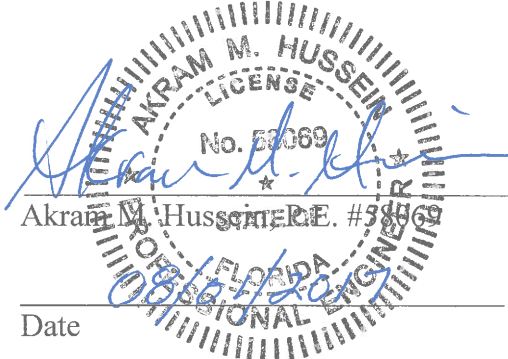
Florida Department of Transportation Determination of Engineering and Operational Acceptability

Acceptance of this document indicates successful completion of the review and determination of engineering and operational acceptability of the Interchange Access Request. Approval of the access request is contingent upon compliance with applicable Federal requirements, specifically the National Environmental Policy Act (NEPA) or Department's Project Development and Environment (PD&E) Procedures. Completion of the NEPA/PD&E process is considered approval of the project location design concept described in the environmental document.

Requestor	 Justin Reck Design Office - District One	8/1/17 Date
Interchange Review Coordinator	 Christopher Simpron Systems Planning Office - District One	8/1/17 Date
State Interchange Review Coordinator	 Andrew Young Systems Planning Office - Central Office	8/2/17 Date
State Chief Engineer	 Courtney Drummond, P.E.	8/2/17 Date

Interchange Modification Report
Interstate 75 and State Road 884 (Colonial Boulevard), Lee County, Florida

I, Akram M. Hussein, Florida P.E. Number 58069, have prepared or reviewed/supervised the traffic analysis contained in this study. The study has been prepared in accordance and following guidelines and methodologies consistent with FHWA, FDOT and Lee County policies and technical standards. Based on traffic count information, general data sources, and other pertinent information, I certify that this traffic analysis has been prepared using current and acceptable traffic engineering and transportation planning practices and procedures.



Akram M. Hussein, P.E. #58069

Date

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SECTION 1 EXECUTIVE SUMMARY

This Interchange Modification Report (IMR) documents the need for improvements at the I-75 and SR 884 (Colonial Boulevard) interchange in the City of Fort Myers in Lee County, Florida. Along I-75, the study limits extend from north of I-75 at Daniels Parkway interchange to south of I-75 at SR 82 (Dr. Martin Luther King Jr Boulevard) interchange. The interchange of I-75 and SR 82 is approximately 1.54 miles north of Colonial Boulevard and, the interchange of I-75 at Daniels Parkway is approximately 4.59 miles south of Colonial Boulevard. Along Colonial Boulevard, the project limits extend from approximately ¼ mile west of Ortiz Avenue to approximately ¼ mile east of Dynasty Drive. The need for interchange improvements was identified in the 2040 Strategic Intermodal System (SIS) Multi-Modal Unfunded Needs Plan, the Collier & Lee Counties 2035 Long Range Transportation Plan (LRTP), and Lee County 2035 Highway Needs Plan. The study interchange of I-75 and Colonial Boulevard will need improvements to accommodate future traffic growth in the vicinity of the interchange and to enhance overall safety, capacity and emergency evacuation within the county.

The Type 2 Categorical Exclusion approved by FHWA on 12/30/2002 as a part of the I-75 PD&E Study from South of Bonita Beach Road to North of SR 78 and the System Interchange Modification Report (SIMR) approved on 8/8/2008 recommended reconfiguring the interchange to a Single Point Urban Interchange (SPUI). Implementing the SIMR preferred alternative would require replacement of the recently reconstructed I-75 bridges over Colonial Boulevard.

An Interchange Operational Analysis Report (IOAR) was approved by FHWA on 7/20/2009 to accommodate the widening of the bridges over Colonial Boulevard as part of FDOT's widening of the I-75 mainline to six lanes in 2011. Shortly thereafter, Lee County widened Colonial Boulevard to six lanes in 2012. In order to salvage the newly widened I-75 bridges, FHWA recommended a reassessment of the interchange.

The purpose of this IMR is to evaluate the operation of the approved preferred alternative at the I-75 and SR 884 (Colonial Boulevard) interchange to meet future traffic needs. The analysis for this IMR was performed in accordance with a Methodology Letter of Understanding

(MLOU) approved by FHWA on May 2013. A copy of the MLOU is attached in **Appendix A**.

This IMR documents the analyses of four potential interchange configurations and provides a determination of the preferred build alternative based on traffic operations and feasibility of construction relative to conserving the recently widened I-75 bridges at Colonial Boulevard. Safety was also considered in determining the preferred build alternative in regards to reducing the number of conflict points. The alternatives considered are listed below.

- **Alternative 1:** Single Point Urban Interchange (SPUI) Configuration – This alternative was accepted as the preferred alternative according to the Type 2 Categorical Exclusion (approved by FHWA on 12/30/2002) as a part of the I-75 PD&E Study from South of Bonita Beach Road to North of SR 78 and the SIMR (8/8/2008).
- **Alternative 2:** Enhanced Existing Eastbound to Northbound Loop Configuration – This alternative will maintain the existing “turbo” lane from eastbound Colonial Boulevard to I-75 northbound on loop ramp along with additional operational improvements at other intersections including the ramp terminal intersections.
- **Alternative 3:** Tight Urban Diamond Interchange (TUDI) – This alternative improves spacing between ramp terminal intersections and adjacent intersections by tightening the ramp intersections closer.
- **Alternative 4:** Diverging Diamond Interchange (DDI) – This is the recommended interchange alternative which improves signal spacing while eliminating the on and off-ramp conflicts with through lanes by removing the left turns from the main traffic stream.

In addition to the needed I-75 interchange improvements, Colonial Boulevard also needs operational improvements within the vicinity of the I-75 interchange. Grade separation at the Ortiz Avenue intersection could improve operations; but would be very costly and limit some key movements. So other more innovative at-grade options were considered at the Ortiz Avenue and Forum Boulevard intersections with Colonial Boulevard. The resulting

“Alternative 4 Improved” is a recommended variation of Alternative 4. It includes the DDI as the recommended interchange alternative and converts the Ortiz Avenue intersection into a Continuous Flow Intersection (CFI) shown in **Figure 1-1** and the Forum Boulevard intersection into a Superstreet (SS) shown in **Figure 1-2**.

Figure 1-1 Continuous Flow Intersection (CFI) Configuration

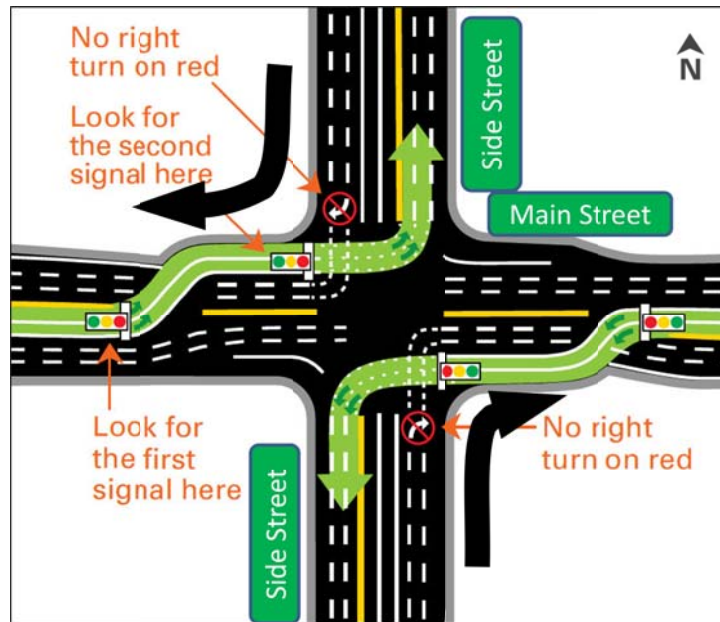
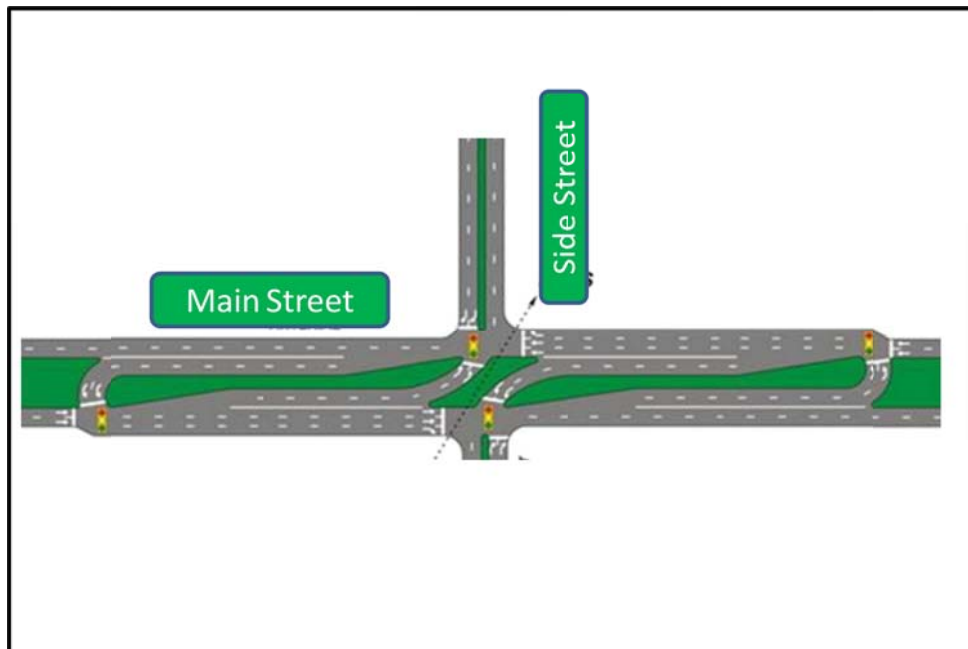


Figure 1-2 Superstreet Intersection (SS) Configuration



A traffic operational analysis was performed for all the above-mentioned build alternatives for the design year 2038. Based upon these analyses, Alternative 4 Improved with the Diverging Diamond Interchange (DDI) configuration is recommended as the preferred build alternative for the I-75 and Colonial Boulevard study interchange. This alternative also satisfies each of the points of the FHWA Policy on Access to the Interstate System as mentioned below.

FHWA Policy Points

Policy Point 1: An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

Under the preferred alternative in this IMR, all the mainline freeway segments along I-75 south of Colonial Boulevard and the ramp merge/diverge junctions from/to

Colonial Boulevard operate at an acceptable level of service. Also, all the study intersections and roadway segments along Colonial Boulevard operate acceptably with the preferred alternative LOS was improved from an F to D or better throughout the corridor as shown in section 11 of this report. The overall average delay reduced by more than 15 seconds per vehicle at Ortiz Avenue and by 20 seconds per vehicle at the ramp intersections and at Forum Boulevard. Queue length for the preferred alternative at the Southbound Ramp intersection was reduced by 200 feet and by approximately 100 feet for the Northbound Ramp intersections.

The preferred alternative will improve safety and traffic operations for both I-75 and Colonial Boulevard. Conceptual plans for the recommended improvements are included as a part of this report. The design of the preferred interchange alternative, along with that of the improvements along Colonial Boulevard in the vicinity, will ensure that pedestrian features, including pedestrian crosswalks, pedestrian ramps, pedestrian signals and sidewalks, are installed per FDOT standards to improve pedestrian safety.

Policy Point 2: The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).

The IMR preferred alternative will retain all traffic movements currently provided at the interchange. The existing interchange at Colonial Boulevard with I-75 is a full interchange with access to Colonial Boulevard and will continue to remain so with the recommended preferred interchange alternative.

To cost effectively improve the operations of adjacent intersections, conversion to a Continuous Flow Intersection (CFI) at Ortiz Avenue and a Superstreet (SS) intersection at

Forum Boulevard is also recommended. However, these intersections do not need to be converted to improve operations of the interchange. The DDI configuration in Alternative 4 improves interchange operation along with protection of the mainline. The intersection improvements are corridor improvements and are only for improving traffic operation along the Colonial Boulevard arterial.

A comparison matrix (Year 2038 Alternative Screening Matrix), **Table 1-1**, has been developed that compares the different interchange alternatives considered for the design year. The results of the operational analysis for each alternative with a statement on its feasibility based on operations and constructability is included in the matrix.

The Tight Urban Diamond Interchange (TUDI) Alternative is a feasible alternative but in the long term, the Diverging Diamond Interchange (DDI) provides a more flexible alternative for the left-turn capacity to be increased for traffic entering the on-ramps by developing a shared lane in either direction without replacing the existing bridge structure. This is not possible with the TUDI. Thus, the DDI will provide additional future capacity than the TUDI and future traffic beyond the design year will be better serviced by the DDI.

From a safety perspective, the DDI should reduce both the overall amount of crashes as well as the severity of crashes compared to the TUDI. The TUDI has twenty-six overall conflict points, with thirteen conflict points concentrated at each of the ramp terminals. The DDI, on the other hand, only has fourteen conflict points. These conflict points are spread out through the interchange, which means that a driver only needs to navigate through one potential conflict at a time. Also, there are only two crossing conflict points in the entire DDI, one at each crossover intersection. This compares to ten crossing conflict points in the TUDI. These crossing conflicts provide more opportunity for more severe crashes.

The DDI was selected as the recommended interchange alternative for the study interchange over the TUDI, and therefore, Alternative 4 Improved - Diverging Diamond Interchange (DDI) with Continuous Flow Intersection (CFI) at Ortiz Avenue and Superstreet Intersection

(SS) is recommended as the preferred alternative. Also, the CFI-DDI-SS provides acceptable arterial level of service along Colonial Boulevard which the TUDI did not provide.

Table 1-1 Year 2038 Alternative Screening Matrix

BUILD ALTERNATIVE	DESCRIPTION	FEASIBLE	REASONS FOR ELIMINATION/SELECTION
1	<p>Single Point Urban Interchange (SPUI) Approved as preferred alternative per I-75 PD&E Study (November 2002) and SIMR (8/8/2008)</p>	No	<ul style="list-style-type: none"> • Require replacement of the recently widened I-75 bridges due to the inability to have the proper geometric curves on the ramps for the left turn movements with the existing I-75 bridge structures over Colonial Boulevard. • The ramp terminal intersection operates with comparatively higher average delay compared to that the other build alternatives. • Colonial Boulevard does not meet arterial LOS. Segment between Dynasty Drive and Forum Boulevard and between I-75 Ramps and Ortiz Avenue do not operate at an acceptable LOS in the westbound direction during AM or PM or both peak periods.
2	<p>Enhanced Eastbound to Northbound Loop Configuration Will maintain the existing “turbo” lane along with additional improvements at ramp terminal intersections</p>	No	<ul style="list-style-type: none"> • Require new ramp bridge over Colonial Boulevard. • Attractive option based on and lesser overall delay corresponding to acceptable level of service at the ramp terminal intersections. • Colonial Boulevard does not meet arterial LOS. Eastbound segment between Rolfes Road and I-75 SB ramps does not operate at an acceptable LOS during the AM peak period and Westbound segment between Dynasty Drive and Forum Boulevard do not operate at an acceptable LOS during both peak periods.
3	<p>Tight Urban Diamond Interchange (TUDI) Will improve spacing between ramp terminal intersections and adjacent intersections</p>	<p>Yes for Interchange configuration but for arterial analysis of Colonial Boulevard does not meet LOS</p>	<ul style="list-style-type: none"> • Does not require replacement of the recently widened I-75 bridges. • The ramp terminal intersections have the highest delay when compared to Alternative 2 and Alternative 4. During the PM peak, the NB Ramp terminal intersection has an average delay for LOS D. • Colonial Boulevard does not meet arterial LOS. Same as Alternative 2.
4	<p>Diverging Diamond Interchange (DDI) Will improve spacing between ramp terminal intersections and adjacent intersections</p>	<p>Yes for Interchange configuration but for arterial analysis of Colonial Boulevard does not meet LOS</p>	<ul style="list-style-type: none"> • Does not require replacement of the recently widened I-75 bridges. • Ramp terminal intersections operate at an average delay for level of service C. • Improve safety with reduction of conflict points. • Colonial Boulevard does not meet arterial LOS due to poor arterial performance. Eastbound segment between Rolfes Road and I-75 SB ramps does not operate at an acceptable LOS during the PM peak period and Westbound segment between Dynasty Drive and Forum Boulevard do not operate at an acceptable LOS during both peak periods.
4 Improved	<p>Diverging Diamond Interchange (DDI) and Improve Colonial Boulevard intersections Will improve spacing between ramp terminal intersections and adjacent intersections with reconfigurations of adjacent intersections</p>	<p>Yes for Interchange and arterial analysis on Colonial Boulevard</p>	<ul style="list-style-type: none"> • Additional Improvements to Alternative 4: Continuous Flow Intersection (CFI) at Ortiz Avenue, Superstreet (SS) at Forum Boulevard • With these two adjacent intersection improvements, Colonial Boulevard will achieve an acceptable arterial LOS in both directions during AM and PM peak periods and all the study intersections operate with considerably low average delay.

This IMR documents operational analyses for the existing year 2012, future years 2018 (opening), 2028 (interim) and 2038 (design). All three future years were analyzed for the No Build and the Build (only preferred build alternative) conditions. I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010. Intersection and Colonial Boulevard arterial analysis was conducted using VISSIM Version 5.40-08 (Patch 8) microsimulation software. Operational analysis of the signalized and un-signalized intersections using SYNCHRO 8.0 was also conducted for the existing conditions only.

EXISTING 2012 CONDITIONS ANALYSIS

The levels of service (LOS) analysis for the existing conditions show that:

- All of the freeway segments and the ramp merge/diverge junctions within the study area operate at an acceptable level of service.
- The overall intersection level of service analysis shows that all the intersections within the study limits operate at an acceptable level of service D or better with the exception of Colonial Boulevard and Ortiz Avenue. Some of the minor approaches do not operate at an acceptable level of service for both the signalized and un-signalized intersections.

OPENING YEAR 2018 ANALYSIS

An analysis of the opening year (2018) was conducted for the build scenario with the design year 2038 Alternative 4 Improved lane configuration.

The analysis results are as shown below.

- All of the freeway segments and the ramp merge/diverge junctions within the study area operate at an acceptable level of service under the Build Alternative 4 Improved condition. The Build Alternative 4 Improved condition along I-75 includes an additional auxiliary lane as planned in each direction between Colonial Boulevard and SR 82. This is a part of the approved I-75 Ultimate (PD&E) Concept as identified in the I-75 PD&E Study dated November 2002, System Interchange

Modification Report (SIMR) approved on 8/8/2008 and also, in Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. When the auxiliary lane is built, I-75 NB Off Ramp to SR 82 needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

- The intersection analysis shows that all the intersections within the study limits operate with average delay at an overall acceptable level of service D or better for the Build scenario.

DESIGN YEAR 2038 ANALYSIS

The design year for this IMR is considered to be 2038. Interchange alternatives were evaluated for the design year and preferred build Alternative 4 Improved was selected based upon traffic operations and feasibility of construction relative to conserving the recently widened I-75 bridges. As stated earlier, Alternative 4 Improved is recommended – the Diverging Diamond Interchange (DDI) alternative with the Ortiz Avenue intersection converted into a Continuous Flow Intersection (CFI) and the Forum Boulevard intersection converted into a Superstreet (SS).

- Under the No-Build condition all of the freeway segments and ramp merge/diverge junctions do not operate at an acceptable level of service during the AM peak period or the PM peak period, or during both the peak periods.
- Under the Build condition, all of the freeway segments and the ramp merge/diverge junctions within the study area operate at an acceptable level of service under the Build condition, with the exception of a weaving segment along I-75 between Colonial Boulevard and SR 82. This weaving segment fails to operate at an acceptable level of service in both northbound and southbound directions based on volume-over-capacity ratios. Therefore, under the Build condition, an additional auxiliary lane was added along I-75 in each direction between Colonial Boulevard and SR 82 to mitigate the weaving issue. When the auxiliary lane is built, the I-75 NB

and SB Off Ramps to SR 82 will each need to be modified into a two-lane diverge for lane balance purposes per AASHTO standards.

The approved I-75 Ultimate (PD&E) Concept includes a ten-lane facility comprised of two express lanes in each direction, three GUL in each direction from north of Daniels Parkway to north of SR 82, and auxiliary lanes between Colonial Boulevard and SR 82. These improvements were identified in the I-75 PD&E Study dated November 2002, System Interchange Modification Report (SIMR) approved on 8/8/2008, and in the Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. Two Special Use Lanes (SUL) were added accordingly in each direction in the design year for improved traffic operation along the I-75 mainline and at ramp merge/diverge junctions.

- The intersection analysis shows that all of the intersections within the study limits, including the ramp terminal intersections, operate with average delay at an acceptable level of service D or better for the recommended Alternative 4 Improved. Colonial Boulevard, as an arterial, also operates at an acceptable level of service under the Build Alternative 4 Improved condition.

SECTION 2 INTRODUCTION, PURPOSE AND NEED

INTRODUCTION

This document serves as the Interchange Modification Report (IMR) submitted by the Florida Department of Transportation District 1 (Requestor), to the Florida Department of Transportation Office of Systems Planning (SPO), and Federal Highway Administration (FHWA). The Methodology Letter of Understanding was approved by FHWA on May 2013 for the I-75 Interchange with SR 884 (Colonial Boulevard) (FPID: 413065-1-32-01) in Lee County, Florida.

Work on this new IMR began in 2013 with numerous alternatives studied. The draft of the IMR was completed in February 2015 with Diverging Diamond Interchange (DDI) design as the preferred build alternative and is ready for submittal to FDOT Central Office for review and approval. The submittal was delayed for almost two years due to on-going coordination with and approval by the City of Fort Myers regarding further improvements at the cross streets east and west of the interchange. This process is now resolved and we are proceeding with the IMR submittal in 2017.

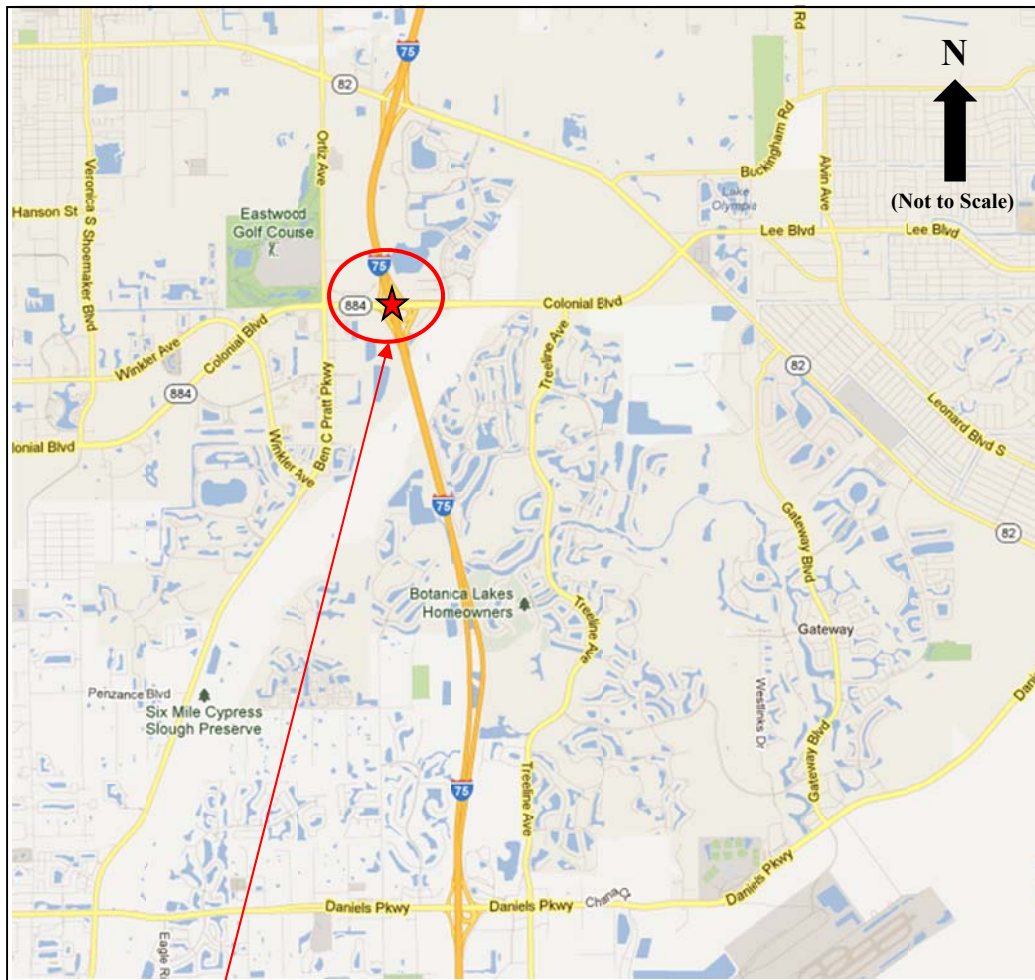
The IMR traffic study developed in 2012 was based on the 2035 Adopted Lee-Collier Cost Feasible (CF) Long Range Transportation Plan (LRTP) model. Since then, a new 2040 CF LRTP District One Regional Planning Model (D1RPM) has been developed. A model volume comparison plot was conducted to determine the traffic volume forecasts differences between the year 2035 CF and year 2040 CF models. The 2035-2040 Model Comparison Plots have been included in Appendix W. Based on the comparison, it was determined that the results using the 2035 model are comparatively conservative; therefore, the original 2038 project traffic forecasts are still recommended for use in this study and are considered to be a high-end conservative forecast. Therefore, the decision was made that it is not necessary to update the design traffic forecasts for the current submittal.

Construction funding for the DDI with a Continuous Flow Intersection (CFI) to the west of the interchange and a Superstreet (SS) to the east as the current preferred alternative is programmed in 2019.

PURPOSE AND NEED

An Interchange Modification Report (IMR) for the interchange of I-75 and SR 884 (Colonial Boulevard) was prepared per request from FDOT District 1. The project limits for the study along Colonial Boulevard extend from approximately ¼ mile west of Ortiz Avenue to approximately ¼ mile east of Dynasty Drive. The subject interchange is located in the City of Fort Myers. Colonial Boulevard, within the project limits, is located in Lee County, Florida. The location of the interchange is depicted in **Figure 2-1**.

Figure 2-1 Interchange Project Location Map



INTERCHANGE LOCATION

The purpose of this project is to re-evaluate the preferred alternative at the study interchange for improved operations to meet future traffic needs. Prior actions at this location include a Type 2 Categorical Exclusion approved by FHWA on 12/30/2002 and a System Interchange Modification Report (SIMR) approved on 8/8/2008 that recommended reconfiguring the interchange to a Single Point Urban Interchange (SPUI) as the preferred alternative. Implementing the SIMR preferred alternative would require replacement of the recently reconstructed I-75 bridges over Colonial Boulevard. An Interchange Operational Analysis Report (IOAR) was prepared by Lee County and approved by FHWA on 7/20/2009. Recently in 2011, FDOT widened I-75 to six lanes and widened the existing bridges over Colonial Boulevard. Also, Lee County widened Colonial Boulevard to six lanes in 2012. In order to salvage the newly widened bridges, FHWA suggested to FDOT a reassessment of the study interchange may be appropriate. This analysis was performed in accordance with the approved Methodology Letter of Understanding (MLOU), the guidelines and methodologies consistent with FHWA, FDOT and Lee County.

According to the 2035 Collier and Lee Counties Long Range Transportation Plan (LRTP), the study section of Colonial Boulevard will be a deficient corridor. Under the existing condition as of year 2009, the level of service (LOS) for the section of Colonial Boulevard from Ortiz Avenue to I-75 is LOS F. According to the Collier and Lee Counties 2035 LRTP, the population of Lee County is expected to increase from 593,136 in 2007 to 1,034,400 in 2035 (increase = 74%) and the employment from 278,203 to 440,334 (increase = 58%).

The proposed interchange improvement at I-75 and Colonial Boulevard and the widening of Colonial Boulevard is needed to help serve travel demands created by anticipated countywide population and employment growth and is anticipated to contribute to better traffic operation. The project is anticipated to enhance overall safety, capacity, and mobility within Lee County, since Colonial Boulevard is a major principal arterial and the future land use designation along this corridor is intensive commercial. In addition, the planned improvements will enhance access to I-75. Colonial Boulevard, a regional facility, is part of the evacuation route network established by the Florida Division of Emergency Management. The improvements to interchange of I-75 and Colonial Boulevard are anticipated to enhance evacuation capacity

and traffic circulation, which will improve evacuation and response times. As a result, the safety of Lee County residents will be enhanced.

The need for this interchange improvement at I-75 and Colonial Boulevard is identified in the 2035 Highway Needs Plan and also identified on the Lee County Highway Cost Feasible Plan included in Collier and Lee Counties 2035 Regional LRTP. This has been included in **Appendix A**. The project's identified objectives meet the provisions of the Moving Ahead for Progress in the 21st Century (MAP-21) Act. Recently in 2011, FDOT widened I-75 to six lanes and widened the existing bridges over Colonial Boulevard. Also, Lee County widened Colonial Boulevard to six lanes in 2012. A number of proposed alternatives that can salvage the newly widened bridges will be considered and analyzed to address these needs.

SECTION 3 METHODOLOGY

A Methodology Letter of Understanding (MLOU) was prepared that was approved by FDOT and FHWA in May 2013 and is included in **Appendix A**.

This report evaluates the preferred alternative at the study interchange of I-75 and Colonial Boulevard for improved operations to meet future traffic needs with anticipated growth and land use changes in the study area. The existing interchange operates as a partial cloverleaf configuration with a single loop ramp (eastbound Colonial Boulevard to northbound I-75) in the southeast quadrant. Colonial Boulevard is six lanes from west of Ortiz Avenue to east of Dynasty Drive with a turbo lane from the eastbound to northbound I-75 loop ramp. I-75 within the study area is six lanes also.

This report documents the existing and the future conditions along with the existing traffic and the projected future traffic.

Analysis Years:

Existing year 2012

Opening year 2018

Interim year 2028

Design year 2038

It was agreed upon in the MLOU that the no-build and only the preferred build alternative will be analyzed for the opening year 2018 and the interim year 2028. The no-build and all the build alternatives will however be analyzed for the design year 2038 in order to determine the preferred build alternative.

Area of Influence:

The study interchange is located in Lee County, in the City of Fort Myers, Florida. The project limits along I-75 extends from southbound off/northbound on ramps at Daniels Parkway (County Highway 876) interchange in the south to southbound on/northbound off

ramps at SR 82 (Dr. Martin Luther King Boulevard) in the north. Along Colonial Boulevard, the study limits extend from ¼ mile west of Ortiz Avenue to ¼ mile east of Dynasty Drive.

Data Collection Procedures and Data Sources:

The existing traffic data comprising of the classification counts, volume counts and turning movement counts were collected during the months of April and May 2012 by GMB Engineers & Planners, Inc. Existing traffic signal timings were collected from Lee County. Corridor travel time and delay data was collected in the field. Crash data for the most recent five years were obtained from FDOT – District 1. The safety analysis for the latest five years (2008 through 2012) was also performed for Colonial Boulevard and I-75.

Base Traffic Data and Traffic Factors:

The design traffic factors (K, D and T) were determined from the existing traffic data and compared against the 2011 Florida Traffic Information (FTI) DVD. The FDOT Standard K factor from Figure 2.4 of the 2012 Project Traffic Forecasting Handbook was recommended for both I-75 and SR 884.

The existing year annual average daily traffic (AADT) volumes were obtained by applying the seasonal adjustment factors to the existing traffic counts performed. The existing year 2012 peak hour traffic volumes have been derived by applying the standard K-factor and the approved D-factor on the AADT using the TURNS5 spreadsheet.

Future Travel Demand Forecasting and Model Adjustments:

The Lee-Collier model was approved and agreed upon by FDOT for use in this IMR study. Subarea validation was performed for the base year 2007 of the Lee-Collier model. These subarea adjustments/refinements were then applied to the future year 2035 of the Lee-Collier model to develop the future travel demand model for use in this study.

Development of Design Traffic:

Future traffic volumes were developed using the 2035 Lee-Collier model, existing traffic volumes, design traffic factors based on the existing counts and TURNS5 spreadsheet.

Future traffic volumes including the annual average daily traffic (AADT) and the AM and PM peak hour volumes were projected for the future years 2018, 2028 and 2038. Also, traffic volumes for 15-minute interval of the peak hours were developed for the opening year 2018 and design year 2038, based on the variation of traffic over 15-minute intervals during peak hours of the existing 2012 traffic counts.

Level of Service Criteria:

The acceptable level of service for the freeway segments and the ramp merge/diverge junctions was considered to be LOS D as stated in the MLOU. Also, according to the Department standards and Lee Plan 2012, the acceptable level of service for the study intersections, ramp terminal intersections and Colonial Boulevard was considered to be LOS D.

Analysis Procedures:

This report documents operational analysis performed in accordance with the approved MLOU, the guidelines and methodologies consistent with FHWA, FDOT and Lee County for the analysis years previously mentioned. For the operational analysis, as stated in the MLOU, the latest version of Highway Capacity Software (HCS 2010 Version 6.4) was used for the analysis of the mainline freeway segments and the ramp merge/diverge junctions. SYNCHRO 8.0 and VISSIM Version 5.40-08 (Patch 8) were utilized for the operational analysis of the signalized and un-signalized intersections. SYNCHRO was used only for the existing analysis. The queue lengths were evaluated for the turn lane improvements based on the intersection analysis using VISSIM.

SECTION 4 EXISTING CONDITIONS

The area of influence studied in this evaluation included in **Figure 4-1** is as follows:

- On Colonial Boulevard, for a length of approximately 1.44 miles, from ¼ mile west of Ortiz Avenue to ¼ mile east of Dynasty Drive;
- On I-75, for a length of approximately 6.13 miles, from I-75/Daniels Parkway (County Highway 876) interchange to the south to I-75/SR 82 (Dr. Martin Luther King Boulevard) interchange to the north. The I-75/Daniels Parkway (County Highway 876) interchange which is approximately 4.59 miles south of Colonial Boulevard will not be impacted.

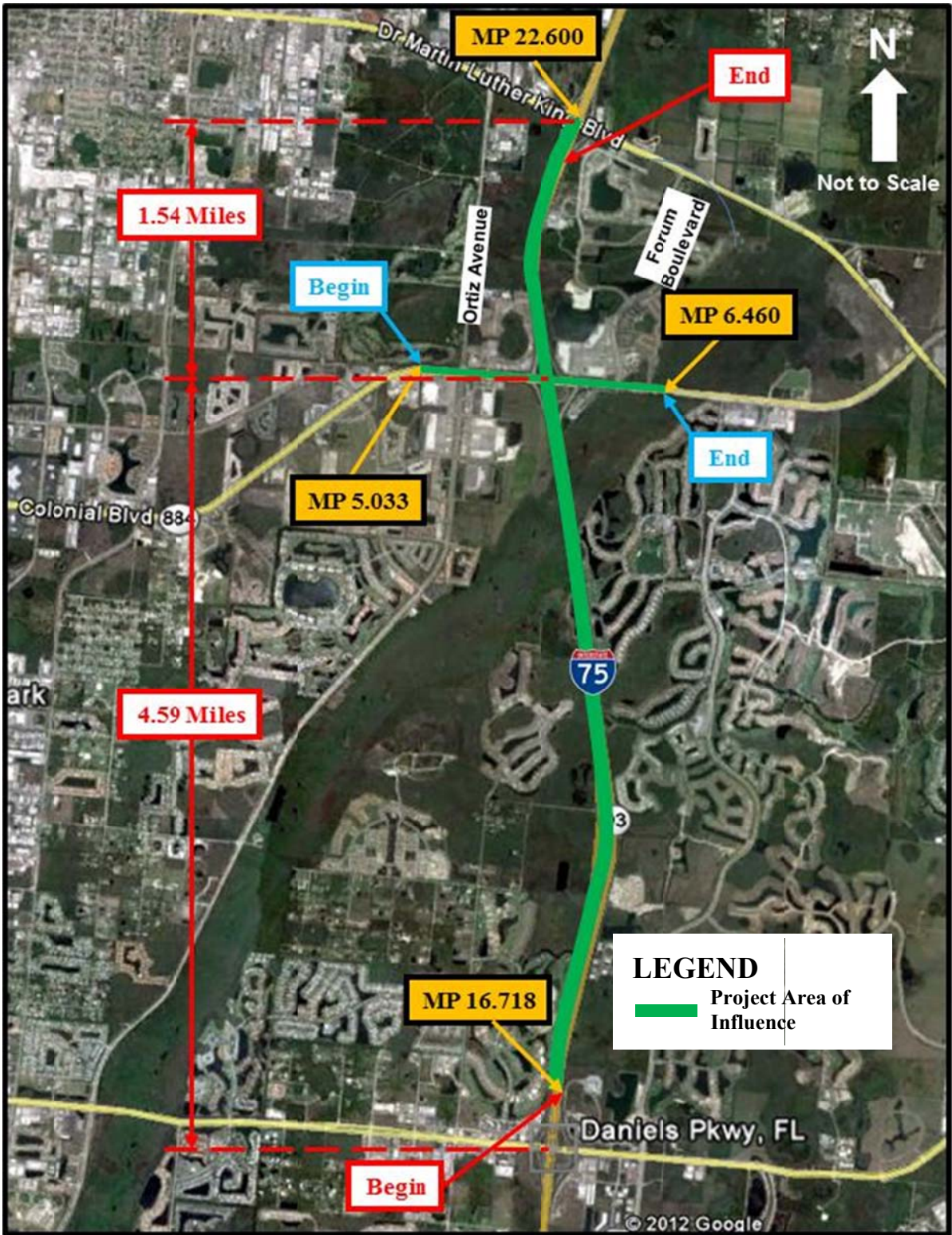
For this Interchange Modification Report, the study area along I-75 and Colonial Boulevard will include the following:

- Roadway Segment along Colonial Boulevard: from West of Ortiz Avenue to East of Dynasty Drive
- Intersections:
 - i. Colonial Boulevard @ Ortiz Avenue
 - ii. Colonial Boulevard @ I-75 Southbound Off/On Ramp
 - iii. Colonial Boulevard @ I-75 Northbound Off Ramp
 - iv. Colonial Boulevard @ Forum Boulevard
 - v. Colonial Boulevard @ Dynasty Drive
 - vi. SR 82 @ I-75 Northbound Off/On Ramp
 - vii. SR 82 @ I-75 Southbound Off/On Ramp
- I-75 Mainline:
 - i. South of Colonial Boulevard
 - ii. North of Colonial Boulevard
- I-75 Ramp Junctions:
 - i. NB Off Ramp to Colonial Boulevard
 - ii. NB On Ramp from westbound Colonial Boulevard
 - iii. NB On Loop Ramp from eastbound Colonial Boulevard

- iv. SB Off Ramp to Colonial Boulevard
- v. SB On Ramp from Colonial Boulevard
- vi. NB Off Ramp to SR 82
- vii. NB On Ramp from SR 82
- viii. SB Off Ramp to SR 82
- ix. SB On Ramp from SR 82

The adjacent interchange to the north at SR 82 is located approximately 1.54 miles north of Colonial Boulevard. The SR 82 northbound off-ramp gore is approximately one mile north of the northbound on-ramp gore at Colonial Boulevard. Therefore, this interchange will be evaluated with this interchange modification proposal. The interchange at Daniels Parkway located approximately 4.59 miles to the south will not be impacted and thus, will not be evaluated.

Figure 4-1 Area of Influence and Interchanges



The existing interchange operates as a partial cloverleaf configuration with a single loop ramp (eastbound Colonial Boulevard to northbound I-75) in the southeast quadrant. The existing lane configuration along Colonial Boulevard is six lanes from west of Ortiz Avenue to east of Dynasty Drive with a turbo lane from the eastbound to northbound I-75 loop ramp. I-75 northbound and southbound ramp terminal intersections operate under signal control. I-75 within the study area is six lanes also. All the on and off ramps to/from I-75 from/to Colonial Boulevard are single lane merge/diverge under the existing conditions.

This study includes four signalized intersections along Colonial Boulevard: at Ortiz Avenue, I-75 southbound ramps, I-75 northbound ramps, and at Forum Boulevard; and an unsignalized intersection at Dynasty Drive. Also, there are two signalized intersections along SR 82 at the I-75 northbound and southbound ramps.

Most of Lee County east and west of I-75 is currently residential and commercial in nature; however, the future land use designation is principally commercial adjacent to the road. As stated earlier, population and employment growth is anticipated in the area.

Colonial Boulevard is functionally classified as an urban principal arterial – other to the west of I-75 and as an urban minor arterial to the east of I-75 within the IMR area of influence. It provides access to US 41 and I-75.

There are no bike lanes within the study section of Colonial Boulevard. There are sidewalks north and south of Colonial Boulevard from west of Ortiz Avenue to east of Forum Boulevard. Both sidewalks and bicycle facilities will be included for the build alternatives.

There is an existing fixed route transit operated by LeeTran along Colonial Boulevard in the study area from Ortiz Avenue to SR 82. Bus route 110 operates through the study area along Colonial Boulevard with stop at Forum Boulevard.

4.1 DATA COLLECTION METHODOLOGY

This section describes the types of data collected and the methods and sources used to obtain this data.

Daily, AM peak hour, and PM peak hour traffic data were collected by GMB Engineers & Planners, Inc on all study roadway segments and study intersections on a typical weekday(s) during the months of April and May of 2012. The following counts were conducted along the study road segments:

7 Day Bi-Directional Traffic Counts & 3 Day Classification Counts:

- Colonial Boulevard east of Forum Boulevard
- Colonial Boulevard west of Ortiz Boulevard

3 Day Classification Counts:

- I-75 approximately ¼ mile north of SB off/NB on Ramp Terminals of Colonial Boulevard
- I-75 approximately ¼ mile south of SB on/NB off Ramp Terminals of Colonial Boulevard
- I-75 approximately ¼ mile north of SB off/NB on Ramp Terminals of SR 82
- I-75 approximately ¼ mile south of SB on/NB on Ramp Terminals of Daniels Parkway

24 Hour Bi-Directional Volume Counts:

- Ortiz Avenue – North and South of Colonial Boulevard
- Colonial Boulevard east of Ortiz Avenue
- Driveway east of Ortiz Avenue, North of Colonial Boulevard
- Driveway east of Ortiz Avenue, South of Colonial Boulevard
- Colonial Boulevard between Rolfes road and I-75 Southbound Ramps
- Colonial Boulevard under I-75 Bridges
- Forum Boulevard – North and South of Colonial Boulevard

- Colonial Boulevard west of Forum Boulevard
- Dynasty Drive – North of Colonial Boulevard
- Colonial Boulevard east of Dynasty Drive

The AADTs at ramp locations listed below were obtained from the 2011 Florida Transportation Information DVD. Growth rates were not applied to these counts as they are consistent with the existing 2012 traffic conditions.

- Southbound on ramp from Colonial Boulevard to I-75
- Southbound off ramp from I-75 to Colonial Boulevard
- Northbound I-75 off ramp to Colonial Boulevard
- Westbound Colonial Boulevard to northbound I-75 on ramp
- Eastbound Colonial Boulevard to northbound I-75 on loop ramp
- Northbound I-75 off ramp to SR 82
- Southbound I-75 on ramp from SR 82
- Northbound I-75 on ramp from SR 82
- Southbound I-75 off ramp to SR 82

Turning Movement Counts (8-hours) - AM and PM peaks will be analyzed

- Ortiz Avenue at Colonial Boulevard (signalized)
- I-75 Southbound off ramp/I-75 Southbound on ramp at Colonial Boulevard (signalized)
- I-75 Northbound off ramp at Colonial Boulevard (signalized)
- Colonial Boulevard at Forum Boulevard (signalized)
- Colonial Boulevard at Dynasty Drive (un-signalized)
- I-75 Northbound off/on ramp at SR 82 (signalized)
- I-75 Southbound off/on ramp at SR 82 (signalized)

The existing traffic count data for the study area were compared against the 2011 FDOT Transportation Information (FTI) DVD as provided by FDOT Central Office's Statistics

Office to check reasonableness. The most current traffic data including existing traffic counts, AADT data, and classification counts were obtained for the IMR analysis. All the existing traffic counts have been provided in **Appendix B**.

Existing traffic signal timings were collected from Lee County. Existing queues, corridor travel times and delay data was obtained or collected in the field for use in the operational analysis and calibration of simulation models as necessary.

4.2 TRAFFIC FACTORS

Historical and recently-collected traffic data were investigated to determine the existing traffic factors along the mainline and cross streets. The minimum and maximum threshold values, as identified in the *2012 Project Traffic Forecasting Handbook*, were considered along with any standard traffic factors developed by the District. The factors have been agreed upon by FDOT – District 1 on July 11, 2012 prior to the initiation of any traffic analysis.

The existing traffic count data for the study area was compared against the “2011 Florida Transportation Information (FTI)” DVD as provided by FDOT Central Office’s Statistics Office.

The K, D and T factors used for traffic projections were determined from existing traffic data and compared against the FDOT traffic DVD as previously mentioned. The memorandum on development of traffic factors (K, D and T factors) was reviewed and approved by the Department on July 11, 2012 before traffic projections were generated. The FDOT Standard K factor from Figure 2.4 of the *2012 Project Traffic Forecasting Handbook* was recommended for both I-75 and SR 884. The following are the factors shown in **Table 4-1** approved by the Department for the existing and the future analysis.

Table 4-1 Approved K, D, T Factors

Roadway	K	D ₃₀	T _{daily}	DHT = 0.5* T _{daily} (Design Hour Truck)
I-75	9.0%	57.0%	13.0%	7.0%
SR 884	9.0%	59.0%	5.5%	3.0%
SR 82 ⁽¹⁾	9.0%	62.0%	8.5%	4.0%
SR 884 and SR 82 Ramps	9.0%	_(²)	8.5% ⁽¹⁾	4.0%

⁽¹⁾ From 2011 FTI CD.

⁽²⁾ As appropriate.

The recommended D-factors are within the acceptable range as indicated in Figure 2-9 of the *2012 Project Traffic Forecasting Handbook*. D-factors as obtained from the existing traffic turning movement counts was approved for the purpose of traffic forecasting along the side streets and the ramps.

Truck factors for the side streets obtained from existing counts were used in the existing (year 2012) and the future analysis.

Other factors are:

Posted Speed: I-75 – 70 mph; Colonial Boulevard – 45 mph within area of influence.

Peak Hour Factor as obtained from the existing 2012 traffic counts for existing analysis.

Peak Hour Factor = 0.95 for future year analysis.

However, for both existing and future analysis of the freeway segments and the ramp merge/diverge junctions, peak hour factor = 0.95.

All the information on the traffic factors including the memorandum on development of traffic factors (K, D and T factors) that was approved by FDOT – District 1 on July 11, 2012 is included in **Appendix C**.

4.3 DEVELOPMENT OF EXISTING TRAFFIC

The existing year 2012 peak hour traffic volumes have been derived by applying the standard K-factor and the approved D-factor on the seasonally adjusted annual average daily traffic (AADT) using the TURNS5 spreadsheet. The outputs were adjusted for balancing (as needed) and for reasonableness. The existing year 2012 AADTs and the existing year 2012 peak hour (AM and PM) volumes were reviewed and approved by FDOT in September 2012 and are included as **Figure 4-2** and **Figure 4-3**, respectively. The memorandum on the existing traffic volumes has been included in **Appendix D**.

4.4 EXISTING YEAR PHYSICAL CONDITIONS

The existing conditions analysis year used for this IMR is 2012, per the approved MLOU; the analysis periods are the AM and PM peak hours. The existing lane configuration along Colonial Boulevard at the I-75 interchange provides for three through lanes in each direction with dual left turn lanes to southbound I-75 on-ramp and single lane to the northbound I-75 on-loop ramp from eastbound Colonial Boulevard and single lane to the northbound I-75 on-ramp from westbound Colonial Boulevard. Both the northbound and southbound off ramps to Colonial Boulevard are single lane exits with a dual left and right turn lanes controlled by traffic signals for both the northbound and southbound ramps at Colonial Boulevard. **Figure 4-4** illustrates the existing lane configuration.

4.5 TRAFFIC TRENDS

Traffic Trends analyses were performed along Colonial Boulevard east and west of I-75 and along I-75 north and south of Colonial Boulevard. The results of the analysis are shown in **Table 4-2** and the data sheet will be included in **Appendix W**.

Table 4-2 Traffic Trends

Count Location	FDOT Count Station	Traffic Count			Annual Historic Growth Rate	
		2006	2012	2016	2012 to 2016	2006 to 2016
Colonial Blvd East of Treeline Ave	124616	N/A	39500	52500	9.33%	N/A
Colonial Blvd West of I-75	120063	83000	75000	85000	3.96%	0.35%
I-75 North of Colonial Blvd	120058	79500	59500	86000	10.33%	1.27%
I-75 South of Colonial Blvd	120057	78500	65000	90000	10.19%	2.02%

Table 4-2 shows significant variability in traffic counts between 2007 and 2015 due to economic volatility during that period. These variations in traffic over that time period have been documented in many locations throughout the state.

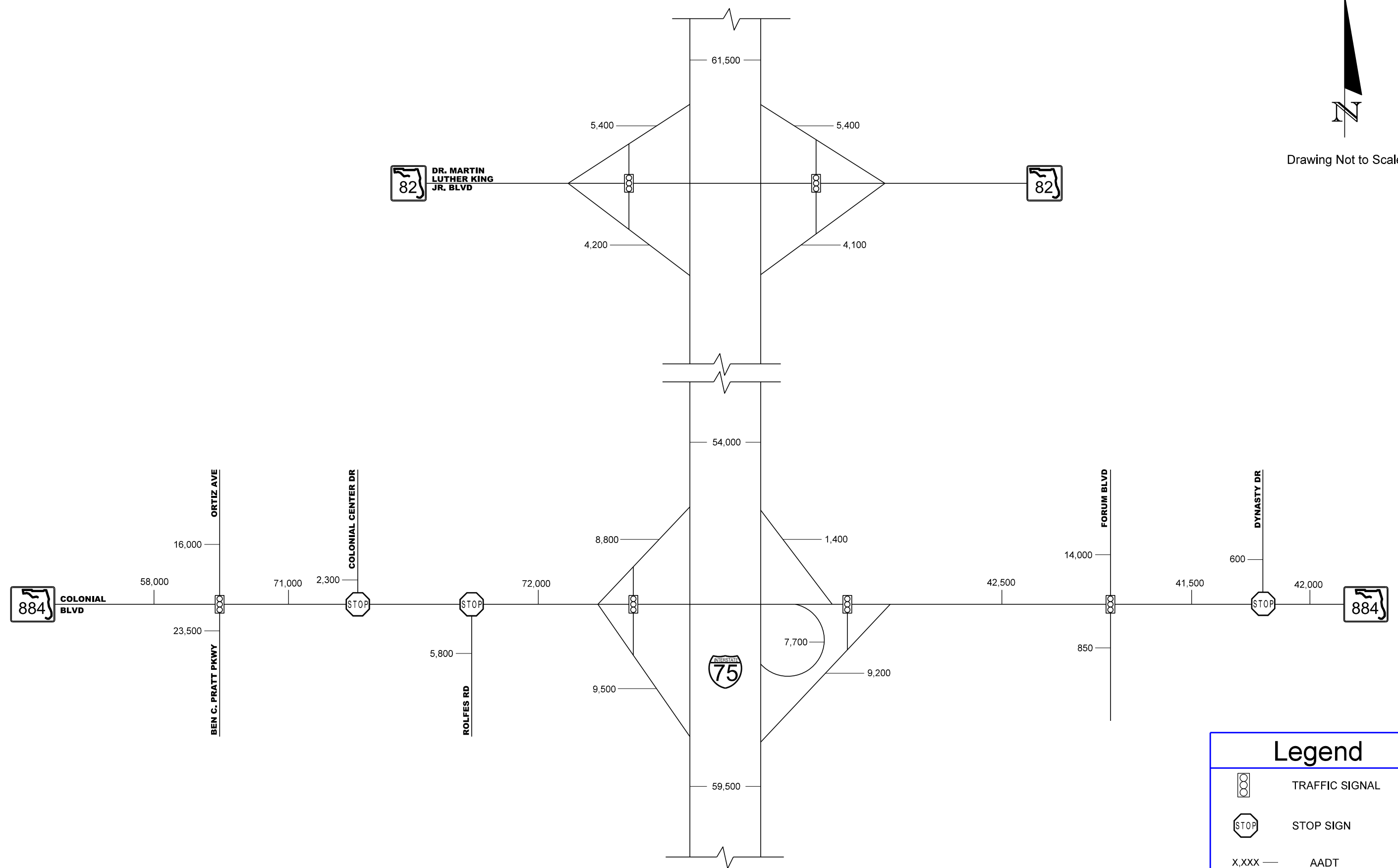
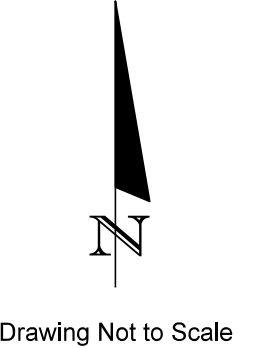
Although traffic has grown significantly during the past 5 years, the longer term traffic growth trends for the study area show annual growth rates in the vicinity of 1 to 2 percent annually.

4.6 TRAFFIC COMPARISON

Traffic volumes were obtained from the 2035 and 2040 model runs. The attached table shows the traffic volumes at key locations within the project limit. This model run is included in Appendix W. The results of the analysis are shown in Table 4-3.

Table 4-3 Traffic Comparison Vehicle/Day

Location	2035	2040	2038
Colonial Blvd East of I-75	81,700	88,700	80,400
Colonial Blvd West of I-75	106,200	111,900	99,700
I-75 North of Colonial Blvd	157,600	108,800	138,000
I-75 South of Colonial Blvd	167,900	108,200	145,000
Ben C. Pratt Pkwy South of Colonial	60,500	41,200	47,800



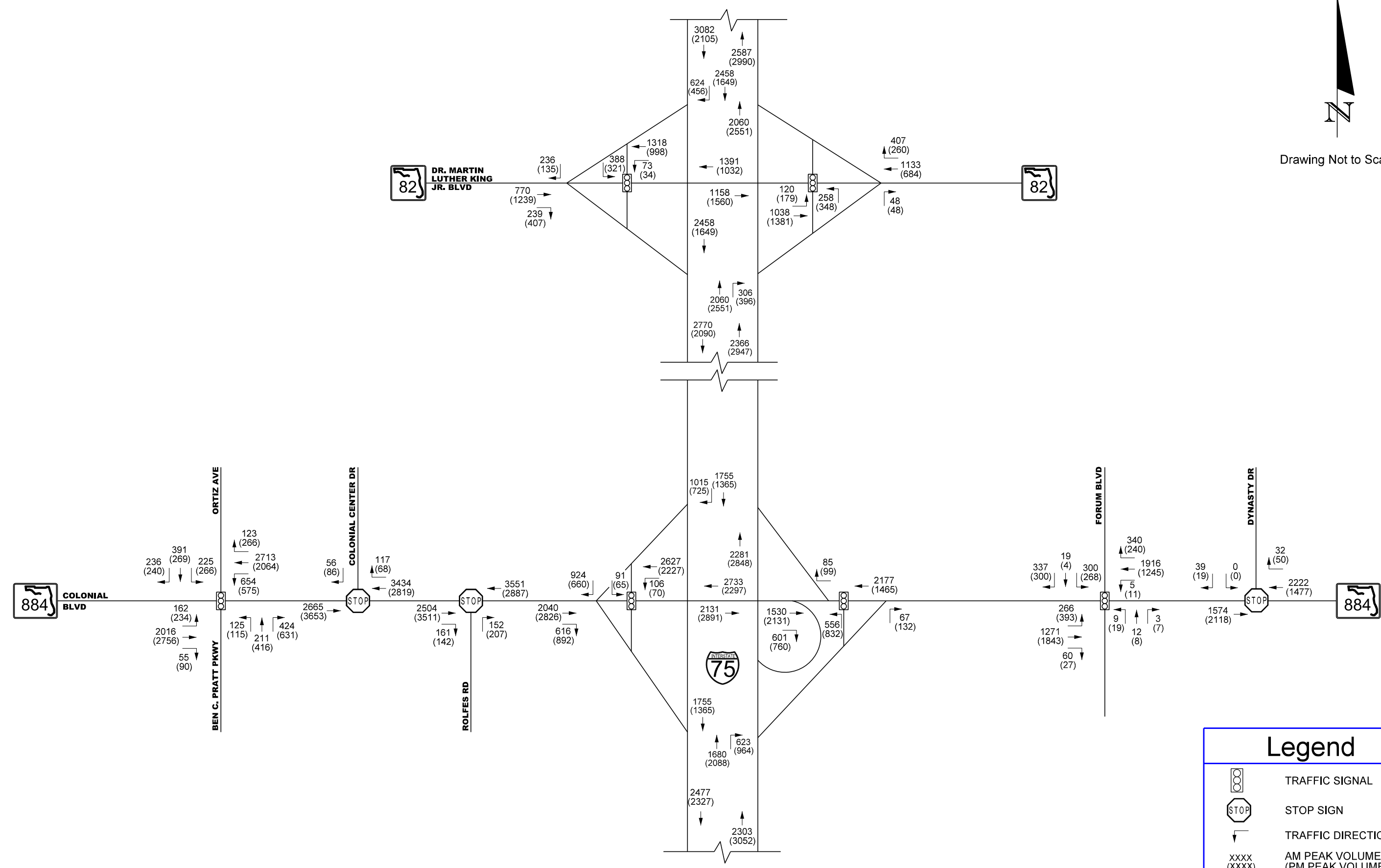
Legend	
	TRAFFIC SIGNAL
	STOP SIGN
X,XXX —	AADT

I-75 at SR 884 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 4-2
Existing Year 2012 AADT



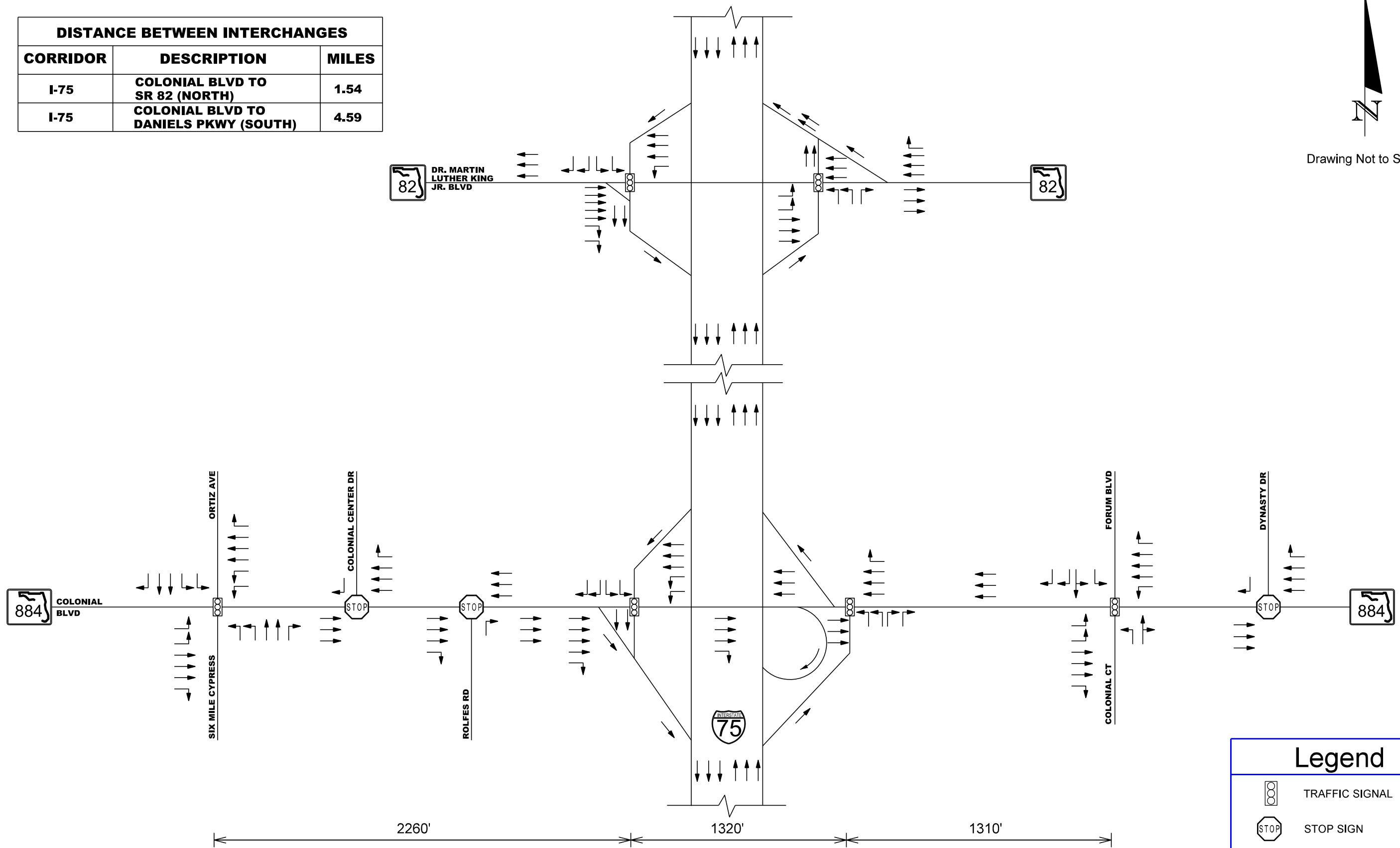
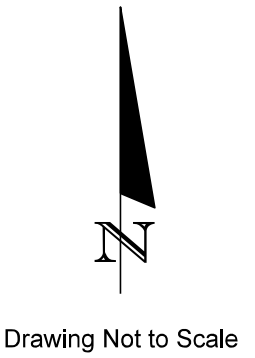
Drawing Not to Scale



I-75 at SR 884 (Colonial Blvd) IMR
 (FPN: 413065-1-32-01)

Figure 4-3
 Existing Year (2012) Peak Hour Traffic Volumes

DISTANCE BETWEEN INTERCHANGES		
CORRIDOR	DESCRIPTION	MILES
I-75	COLONIAL BLVD TO SR 82 (NORTH)	1.54
I-75	COLONIAL BLVD TO DANIELS PKWY (SOUTH)	4.59



Legend	
	TRAFFIC SIGNAL
	STOP SIGN
	EXISTING LANES

I-75 at SR 884 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 4-4
Existing Intersection Lane Geometry

4.7 CRASH ANALYSIS

The crash data for the most recent five years 2008 through 2012 was obtained from FDOT District 1 along I-75 between M.P. 16.718 to M.P. 22.352 and along Colonial Boulevard between M.P. 5.033 to M.P. 6.460. This information was compiled and summarized for the most recent five-year period (2008 – 2012). Along I-75, within the study limits, there were 250 total crashes with 6 fatal crashes and 115 injury crashes. Along Colonial Boulevard, within the project limits, in the last 5 years, there were a total of 632 crashes with 286 injury crashes and 2 fatal crashes. The crash rates were computed which were then compared to the average statewide crash rate. These calculations are provided in **Appendix E**. Based on the comparison of the actual crash rate with the statewide average crash rate the high crash locations were identified to be the intersections of Colonial Boulevard and Ortiz Avenue, Colonial Boulevard and Forum Boulevard and the segment of Colonial Boulevard between I-75 SB Ramps and I-75 NB Ramps. Collision diagrams were prepared for the high crash locations only. The detailed crash summary demonstrating total, fatal and injury crashes by year following the Manual on Uniform Traffic Studies (MUTS) has also been included in **Appendix E** along with the collision diagrams prepared for the high crash locations.

There were two pedestrian fatalities along Colonial Boulevard at Ortiz Avenue in the year 2009 and between the ramp intersections in the year 2008. Through the design of the interchange alternative along with Colonial Boulevard in the vicinity, it will be ensured that pedestrian features including pedestrian crosswalks, pedestrian ramps, pedestrian signals and sidewalks are installed per FDOT standards to improve pedestrian safety.

SECTION 5 OPERATIONAL ANALYSIS PROCEDURES

Operational analysis procedures were performed with projected traffic volumes for the existing year 2012 and for the future scenarios for build and no-build conditions for years 2018, 2028 and 2038. The operational analysis evaluated the impacts of the proposed improvements on the interchange operation. The system operational analysis is performed to determine the impacts on the entire system's operational performance when capacity or geometry changes are made to a particular transportation system element.

As stated in the MLOU, the latest version of Highway Capacity Software (HCS 2010 Version 6.4) was used for the analysis of the mainline freeway segments and the ramp merge/diverge junctions. SYNCHRO 8.0 and VISSIM Version 5.40-08 (Patch 8) were utilized for the operational analysis of the signalized and un-signalized intersections. SYNCHRO was used to optimize the interchange and signal timings. The queue lengths were evaluated for the turn lane improvements based on the intersection analysis using VISSIM.

All of the SYNCHRO, VISSIM and HCS input parameters were either default or field-derived data. The existing signal timings were obtained from the Lee County Traffic Department and future signal timings were optimized using SYNCHRO.

Operational analyses were performed using the appropriate software tool as discussed above on the individual elements of the transportation system, as follows:

Basic Freeway Segments:

I-75 Mainline South of Colonial Boulevard

I-75 Mainline North of Colonial Boulevard

Ramp Merge/Diverge Locations:

Northbound I-75 Off-Ramp to Colonial Boulevard

Northbound I-75 On-Ramp from westbound Colonial Boulevard

Northbound I-75 On-Ramp from eastbound Colonial Boulevard

Southbound I-75 Off-Ramp to Colonial Boulevard

Southbound I-75 On-Ramp from Colonial Boulevard

Northbound I-75 Off-Ramp to SR 82

Northbound I-75 On-Ramp from SR 82

Southbound I-75 Off-Ramp to SR 82

Southbound I-75 On-Ramp from SR 82

Ramp Terminal and Cross Street Intersections:

Colonial Boulevard @ Ortiz Avenue (signalized)

Colonial Boulevard @ I-75 Southbound Off/On Ramp (signalized)

Colonial Boulevard @ I-75 Northbound Off Ramp (signalized)

Colonial Boulevard @ Forum Boulevard (signalized)

Colonial Boulevard @ Dynasty Drive (un-signalized)

SR 82 @ I-75 Northbound Off/On Ramp (signalized)

SR 82 @ I-75 Southbound Off/On Ramp (signalized)

Roadway Segment:

Colonial Boulevard from west of Ortiz Avenue to east of Dynasty Drive

5.1 ADOPTED LEVEL OF SERVICE

The acceptable level of service for the freeway segments and the ramp merge/diverge junctions is LOS D as stated in the MLOU. Also, according to the Department standards and Lee Plan 2012, the acceptable level of service for the study intersections, ramp terminal intersections and Colonial Boulevard is LOS D.

5.2 ANALYSIS YEARS

The following are the proposed analysis years for this study:

- Existing Year: 2012 AM and PM Peak
- Opening Year: 2018 AM and PM Peak No-Build and Preferred Build Alternative
- Interim Year: 2028 AM and PM Peak No-Build and Preferred Build Alternative
- Design Year: 2038 AM and PM Peak No-Build and Screening of Build Alternatives

Alternative 4 Improved is the final recommended build interchange and build alternative for improving adjacent intersections along Colonial Boulevard based on screening analysis of the evaluated proposed interchange alternatives for the design year 2038.

Alternative 4 Improved was introduced during the planning part of this project where the DDI remained as the recommended interchange alternative, but the arterial operation along Colonial boulevard did not meet Level of Service criteria. This was achieved with additional improvement at Ortiz Avenue and Forum Boulevard.

It was agreed to present the results only for the preferred alternative and the no-build alternative for analysis years 2018, 2028, and 2038. These were analyzed and results were presented in the report.

SECTION 6 MODEL DEVELOPMENT AND CALIBRATION

6.1 MODEL DEVELOPMENT

Traffic simulation models VISSIM 5.40-08 and SYNCHRO 8.0 and capacity analysis software (Highway Capacity Software 2010 Version 6.4) were used to replicate the existing conditions and assess the impact of future traffic growth. While VISSIM and SYNCHRO were used to model the entire study network, HCS was exclusively used to analyze the I-75 freeway segments, and ramp merge / diverge segments. Calibration and validation efforts involved comparing the various measures of effectiveness (MOE) such as capacity, travel time and speeds to achieve similar results between the model and field data.

Aerial photographs for the entire study area were downloaded from Google Earth and imported as a background into VISSIM. The road network model was then developed over the scaled aerial photographs in VISSIM. Similar processes were followed in the development of the SYNCHRO road network through Bing maps. SYNCHRO's built-in feature allows users to download scaled aerial photographs of the study area. All other input parameters such as intersection geometric configurations, lane configurations, traffic volumes and compositions, speed limits and other location specific information collected from the field was then provided as input to the models to replicate field conditions. The suggested default driver behavior parameters in the models provided good starting points but need to be adjusted through calibration to replicate field conditions. The existing balanced traffic volumes were inputted into both SYNCHRO and VISSIM. The volumes included the entire Colonial Boulevard corridor as well as I-75 traffic from south of Colonial Boulevard to north of SR 82. I-75 and SR 82 diamond interchange was also included in the model with both signalized intersections at the end of the ramps. The existing signal timings provided by Lee County were used for all traffic signals. Further detailed explanation regarding VISSIM and SYNCHRO calibration is provided in the "Calibration" section of this document.

The future alternative models for the years 2018, 2028, and 2038 were developed for the AM and PM peak periods with the calibrated factors for driver behavior with suitable modifications to the geometry, traffic volumes, and signal timing. For all the projected I-75

traffic volumes, a conservative assumption was made that three General Use Lanes (GUL) and one auxiliary lane on I-75 would carry the entire traffic except for the 2038 PM peak hour condition. During the 2038 PM peak hour condition, 1,600 vehicles were assumed to use I-75 northbound Special Use Lanes (SULs). The capacity of 1600 vehicles per hour per lane on the special use lanes was assigned to ensure that SUL will operate at LOS C. The analysis took a very conservative look at the general use lanes. Based on that, the analysis assumed that 1,600 veh/hr/ln was the maximum amount of traffic that could be shifted from the GUL to the SUL. However this did not mean that there would be an automatic shift of traffic. The assumption was if traffic was running smoothly in the GUL and there were no weaving, merge, or diverge issues at the interchange, then no traffic would shift to the SUL. In isolation, this would be generally the case, because drivers would not be likely to pay a toll when the non-toll lanes are not congested. Although more vehicles could be in the SUL because of congestion prior to or upstream to the Colonial Blvd interchange, this approach was still determined to be the conservative approach, so all the analyses began with this assumption. After this initial analysis was completed, any scenario that did not meet the acceptable LOS was then allowed to shift traffic from the GUL to the SUL until either (a) an acceptable LOS was achieved or (b) the SUL reached the maximum amount of traffic. All these scenarios were able to reach an acceptable LOS by shifting some traffic from the GUL to SUL without reaching the maximum capacity of the SUL.

The approved Ultimate (PD&E) Concept along I-75 includes a ten-lane facility comprising of two express lanes in each direction and three GUL in each direction from north of Daniels Parkway to north of SR 82 and auxiliary lanes along local access freeway between Colonial Boulevard and SR 82. This has been identified in I-75 PD&E Study dated November 2002, System Interchange Modification Report (SIMR) approved on 8/8/2008 and also, in Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. When the auxiliary lane is built, I-75 NB Off Ramp to SR 82 needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

A freeway facility network along each direction of I-75 within the study area was developed using HCS. This freeway facility network incorporates various types of segment analysis such as freeway basic, weaving, merge and diverge analysis in a single network. The lengths of the merge and diverge ramp influence zones were calculated based on the Highway Capacity Manual 2010 (HCM) methodology.

For all the build alternatives along I-75, there needed to be a determination of whether the auxiliary lanes between Colonial Boulevard and SR 82 was considered a weaving movement based on the HCS modeling criteria. All future alternative models have similar segment types to the existing freeway facility network except for the Enhanced Loop Alternative along the northbound direction. Ramps in the Enhanced Loop Alternative from eastbound and westbound Colonial Boulevard to I-75 northbound merge together before entering mainline I-75. This reduces the base length between interchanges creating a weaving segment. The L_{MAX} distance calculation formula from the HCM is shown below:

$$L_{MAX} = [5,728 (1+VR)^{1.6}] - [1,566 N_{WL}]$$

Where:

L_{MAX} = maximum weaving length

VR = ratio of weaving volume to total segment volume

N_{WL} = number of lanes from which weaving maneuver may be made with one or no lane changes

According to Exhibit 10-13 in the HCM, a weaving segment exists if the Base Length (L_B) is less than or equal to the maximum length of the weaving segment, i.e. $L_B \leq L_{MAX}$. **Table 6-1** shows L_{MAX} calculations for the 2018 and 2038 build years for all alternatives except for Enhanced Loop Alternative.

Table 6-1 Maximum Weaving Distance Calculation along I-75

Year	Direction	Peak	Weaving Volume	Non-Weaving Volume	Total Volume	VR	N _{WL}	Max Weaving Length in feet (L _{MAX})	Base Length in feet (L _B)	Weaving Segment ? (L _B ≤ L _{MAX})
2018	NB	AM	1328	1829	3157	0.421	2	6,914	4,700	Yes
		PM	1700	2326	4026	0.422	2	6,932		Yes
2038		AM	2466	2872	5338	0.462	2	7,385		Yes
		PM	2989	1700	4689	0.637	2	9,477		Yes
2018	SB	AM	1702	2058	3760	0.453	2	7,278	4,750	Yes
		PM	1564	1572	3136	0.499	2	7,812		Yes
2038		AM	2987	1870	4857	0.615	2	9,201		Yes
		PM	2556	2530	5086	0.503	2	7,856		Yes

The table above shows that weaving segment exists for all the alternatives along I-75 in both directions between Colonial Boulevard and SR 82. As stated previously, weaving segment exists if $L_B \leq L_{MAX}$. Also, the Enhanced Loop Alternative has a basic segment length of 3,700 feet (less than the maximum weaving length) in the northbound direction. Hence a weaving segment exists in Enhanced Loop Alternative.

Vehicle Input

Vehicle inputs in VISSIM are separated into 15-minutes intervals for the existing, opening and design years (these volumes are included in **Appendix L**). For alternatives with congested network during simulation, vehicle inputs are provided for the duration covering congestion build-up to recovering. Fifteen-minute traffic volumes for AM peak were provided from 7:00 AM-9:00 AM and 3:45 PM-6:00 PM. Based on the provided peak hour traffic volumes, AM peak hour is identified from 7:15 AM-8:15 AM and PM peak hour from 4:45 PM-5:45 PM. A 15-minute seeding period before the start of the peak hour is added to the simulation duration.

For the existing year 2012 analysis, during AM peak the volume input and 15-minute seeding period starts from 6:45 AM. The actual simulation starts at 7:00 AM through 8:15 AM. As

the traffic congestion dissipates at 8:15 AM in the simulation, no further volume inputs were provided in VISSIM. Similarly during PM peak, seeding periods starts at 3:30 PM and simulation begins at 3:45 PM and ends at 6:30 PM. It is to be noted that traffic volumes were only provided from 3:45 PM to 6:00 PM. As traffic congestion was noticed to continue after 6:00 PM, volume inputs for the duration beyond 6:00 PM were provided in VISSIM to identify approximate dissipation time. For this additional analysis period, volumes from 5:45 PM-6:00 PM interval were used in the analysis. Traffic congestion was noticed to significantly dissipate around 6:30 PM, with this conservative assumption.

For future design year 2038 analysis, except for preferred alternative, the simulation duration for the AM peak analysis extended till 9:00 AM. The PM simulation duration is similar to existing year 2012 analysis (3:45 PM-6:30 PM). For the preferred alternative, as no congestion was noticed, simulations were recorded until the end of the AM (6:45-8:15) and the PM (3:45-5:45) peak hours. Irrespective of simulation durations, results were recorded to reflect the actual AM (6:45-8:15) and PM (3:45-5:45) peak hours in the field.

Data Recording and Processing

Physical nodes are coded using “nodes” function in VISSIM outlining all the signalized and un-signalized intersections in the network to collect required MOE data. Queue counters are individually placed at stop bars along each approach. It is to be noted that each node or queue counter collects data from study intersection to the next upstream intersection node in that direction. For instance the node and the queue counter along westbound at Ortiz Avenue (#1) collects data from Ortiz Avenue to the next node, Colonial Center Drive. In the future 2038 year AM peak hour, congestion was noticed along westbound direction at Ortiz Avenue and Forum Boulevard. Coding nodes at Colonial Center Drive and Dynasty Drive would not yield accurate queue or/and intersection delays at respective downstream signalized intersection. For this reason, MOEs at Colonial Center Drive and Dynasty Drive are collected separately and respective files are included.

After data recording, intersection delay numbers are obtained from analyzer database function and queue numbers from individual queue counters.

6.2 MODEL CALIBRATION

The goal of calibration is to best replicate the existing model to the field conditions. This provides accurate results by reflecting the driver behavior characteristics in the existing condition. These calibration parameters are then used to model the future year conditions and assess its impact on the roadway network.

Critical MOE's such as travel time and speed are used for validation purposes in addition to capacity. A difference less than ten percent is generally considered acceptable between the MOE's measured in the field and the model. Also, as suggested in the FHWA toolbox Volume III and Oregon Department of Transportation (ODOT) Protocol for VISSIM Simulation manual, a calculated "GEH" statistic value is expected to be less than five for better calibration results. As stated in the ODOT VISSIM manual, the GEH statistic is a widely used empirical formula to validate or compare traffic MOE's and is shown below:

$$GEH = \sqrt{\frac{2(m-c)^2}{m+c}}$$

Where,

m = output traffic volume from the simulation model (vph),

c = input traffic volume (vph).

Appendix F includes the GEH values and calibration results comparing the modeled link volumes to field volumes along I-75 and Colonial Boulevard using VISSIM along with the driver behavior calibration.

In order to begin the process of calibration, all the default parameters have to be tested first and then adjusted to achieve best results. Calibration was conducted through an iterative process that tested different parameter settings to match existing conditions as closely as possible. Travel time runs were conducted to determine average speed along Colonial Boulevard and I-75 on August 14, 2012. Six runs were conducted in the field in each direction along I-75 northbound and southbound from NB On Ramp/SB Off Ramp from/to Daniels Parkway to NB Off Ramp/SB On Ramp to/from SR 82 and along Colonial

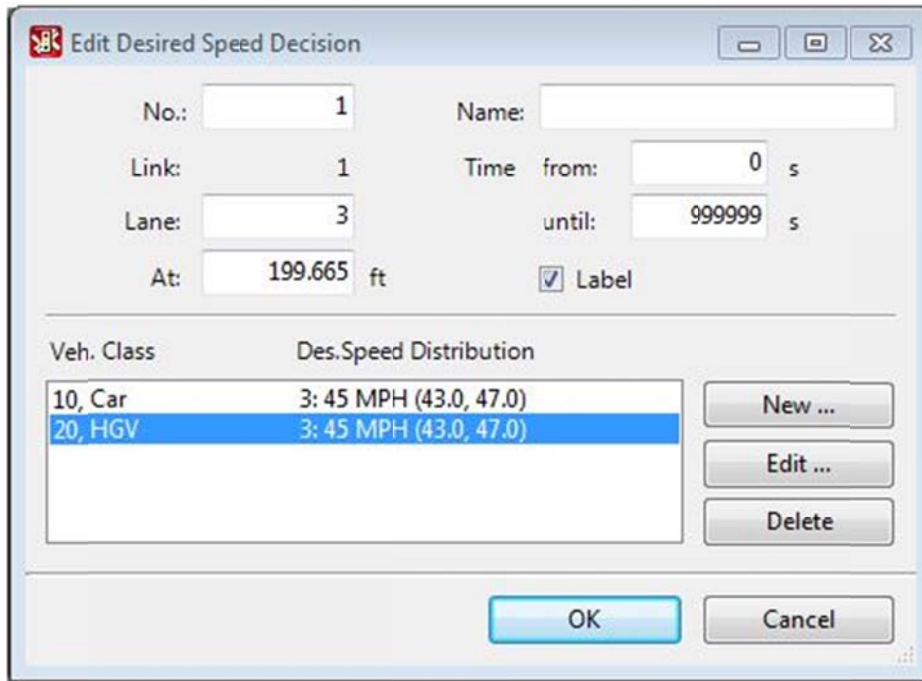
Boulevard from Ortiz Avenue to Dynasty Drive in the eastbound and westbound direction. In the field, during the AM peak, congestion was observed in the westbound direction along Colonial Boulevard between Forum Boulevard and Ortiz Avenue. In the PM peak, congestion was observed in the field along eastbound Colonial Boulevard from west of Ortiz Avenue that dissipates between I-75 SB and I-75 NB Ramp intersections. Summary of travel time delay data are included in **Appendix F**.

Network Coding

VISSIM interface uses a link-connector approach allowing the user to define driving behavior for each link or connector if required. Unlike SYNCHRO, intersections in VISSIM are not defined as physical nodes but are defined by placing traffic control restrictions. Signal, stop, and yield controls were placed at each intersection by referencing existing conditions. Signal timing obtained from Lee County was inputted to the VISSIM RBC Controller. All the lane drops, storage lengths, and ramp merge/diverge distances were coded to match existing field conditions.

The posted speed limit is 45 mph along Colonial Boulevard and 70 mph along I-75. VISSIM does not use standard speed limit as inputs but allows the user to specify a range of speed distribution as shown in **Figure 6-1** to allow for variation in speeds by different drivers.

Figure 6-1 VISSIM Desired Speed Distribution on Colonial Boulevard

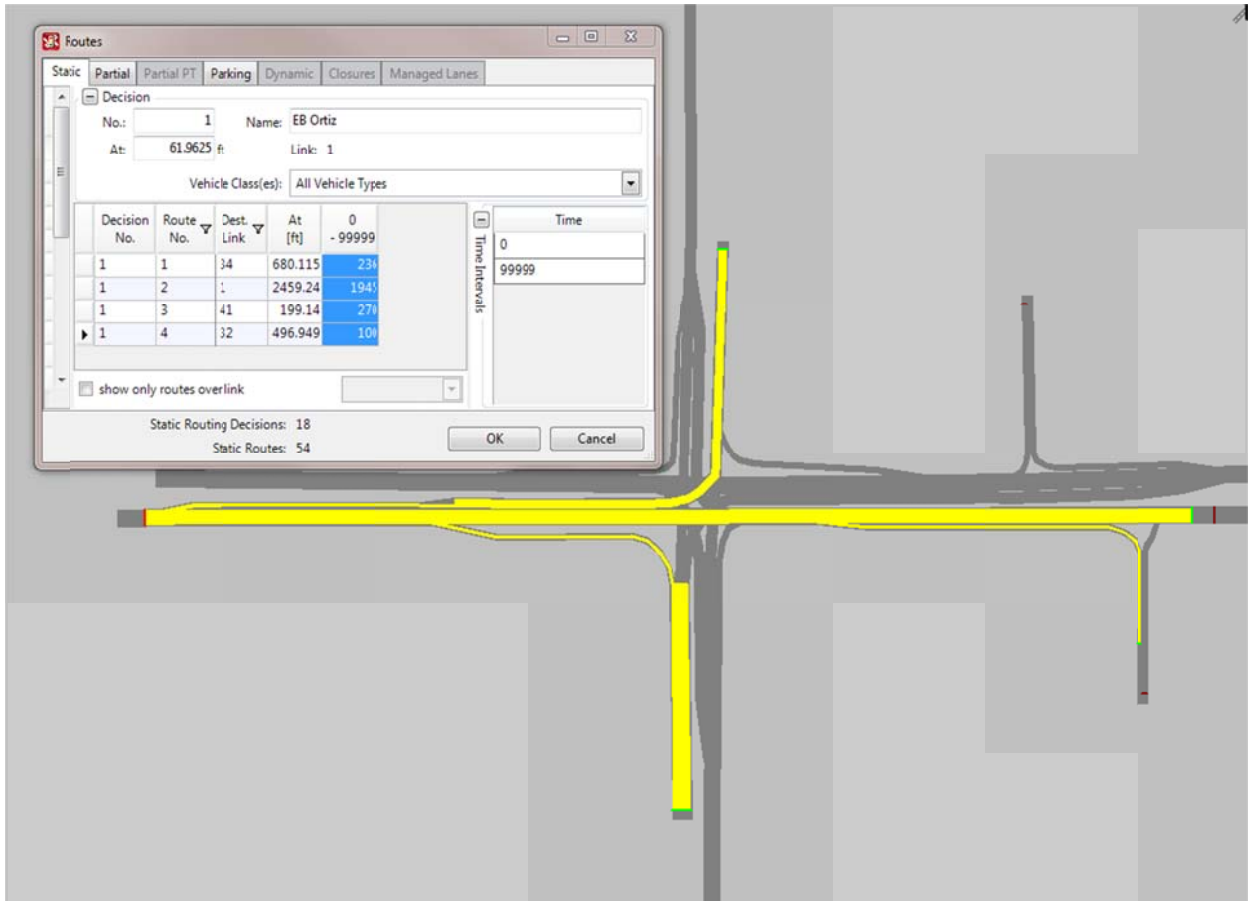


For calibration purposes, the free flow speed should naturally match closely in the model as in real conditions. However, because the real traffic volumes were balanced and were therefore not the true volume of traffic, there was expectancy for some variation in speeds that were not free flow.

Traffic Origin-Destination (O-D) Routing

VISSIM uses a “Routing Decision” feature where vehicles are routed from its origin point to its destination. Traffic movements at intersections are obtained from traffic counts and then the origin point is coded in VISSIM at the beginning of each link. The destination point is coded at the downstream end of its movements just past the intersection. This process is continued for all the movements at each individual intersection. It should be noted that in this process each vehicle is assigned to its destination at the origin. **Figure 6-2** shows routing for eastbound traffic along Colonial Boulevard at the Ortiz Avenue intersection.

Figure 6-2 Intersection Routing Decision



All the individual routing decisions along the mainline are then combined to obtain the proportion of eastbound volume in each movement along the corridor. **Figure 6-3** shows the routing for eastbound traffic after all the routes for within the network have been combined.

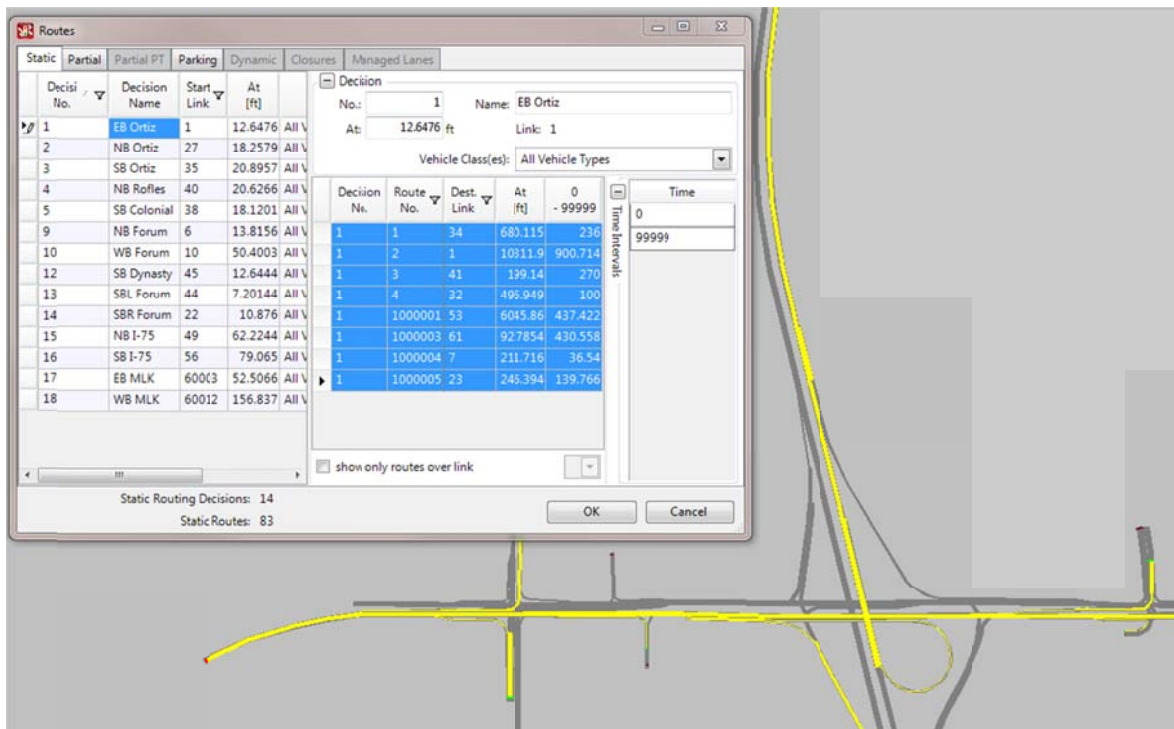
Since O-D data was not available, traffic was proportionately divided in the network based on the approach volumes. A few assumptions were made for the O-D as follows:

1. The eastbound Colonial Boulevard volume constitutes 90 percent of the traffic turning right onto Rolfes Road. The remaining 10 percent of the turning traffic is assumed to arrive from southbound Ortiz Avenue. This assumption was made because traffic from the south along Ortiz Avenue has prior access points to the same development that Rolfes Road has.
2. To analyze the worst case scenario, it is assumed that traffic from Colonial Boulevard along both directions do not use I-75 to reach SR 82 and vice-versa. This assumption

considers the entire ramp traffic as weaving traffic along I-75 between the two interchanges. Due to the connections along both Ortiz Avenue and Forum Boulevard that connect Colonial Boulevard and SR 82 parallel to I-75, along with Colonial Boulevard intersecting SR 82 about 2.25 miles east of interchange, there is likely only a very small percentage of traffic that uses I-75 solely to travel to or from Colonial Boulevard and SR 82.

3. U-Turn volumes at the interchange from/to I-75 ramps are assumed to be none.

Figure 6-3 Combined Network Routing Decision



Traffic Composition

Balanced traffic volumes for the years 2012, 2018, 2028 and 2038 were computed from the traffic counts. The base year 2012 heavy vehicle percentage was observed as 5.5 percent along Colonial Boulevard and the side street heavy vehicle percentage was computed from field volumes. Design year truck factors were similarly computed from traffic forecasts and existing traffic volumes. **Appendix F** also includes the recommended truck factors used in analysis.

Peak hour factors (PHF) for the base year 2012 were computed from field volumes. A 0.95 PHF was used for all future alternatives.

Driving Behavior

The VISSIM models driving behavior were based on link types. “Wiedemann 74 and 99” are the two car following models used by VISSIM for modeling general traffic and freeway traffic. By default, the former model is suggested for coding arterials or collectors and the latter for freeway type links. All the link-connectors along Colonial Boulevard have been coded with “Wiedemann 74” car following model. Similarly, all the I-75 freeway link-connectors were coded as “Wiedemann 99” car following model. For weaving/merge sections along I-75 “Wiedemann 99” model is used with adjustments to default parameters. The default values of Wiedemann 74 and Wiedemann 99 car following models are given below:

Wiedemann 74 Following Parameter	Unit	Default
Average Standstill Distance	ft	6.56
Additive part of safety distance		2
Multiplic. part of safety distance		3
Wiedemann 74 Lane Change Parameter	Unit	Default
Minimum Headway	ft	1.64

Wiedemann 99 Following Parameter	Unit	Default
CC0 (Standstill Distance)	ft	4.92
CC1 (Headway Time)	s	0.9
CC2 (Following Variation)	ft	13.12
CC3 (Threshold for Entering "Following")		-8
CC4 (Negative "Following" Threshold)		-0.35
CC5 (Positive "Following" Threshold)		0.35
CC6 (Speed Dependency Oscillation)		11.44
CC7 (Oscillation Acceleration)	ft/s ²	0.82
CC8 (Standstill Acceleration)	ft/s ²	11.48
CC9 (Acceleration at 50 mph)	ft/s ²	4.92
Wiedemann 74 Lane Change Parameter	Unit	Default
Minimum Headway	ft	1.64

The calibration process is conducted through an iterative process that first tested default driving and lane changing parameters. The travel time results from the analysis using default parameters are then compared to field numbers. Any inconsistencies between the model and field values would indicate improper calibration. Further calibration is conducted by

tweaking/adjusting various model parameters for best field replication. The parameters in VISSIM models were calibrated within acceptable parameters of MOE's as suggested in the ODOT Protocol for VISSIM Simulation manual after an iterative process. After a few iterations, the lane changing parameters for "cooperative lane changing" needed to be adjusted to model realistic driving behavior. The cooperative lane change parameter allows drivers to create gaps or change lanes in order to make room for vehicles that are changing lanes. These parameters had slight differences during the AM and PM peak periods along I-75 and at the intersections along Colonial Blvd. based on the change in driving behavior at various levels of traffic as reflected in the field data. This does change the saturation flow rate slightly due to the changes in driving behavior in more congested conditions, but is also considered a more conservative model for future conditions. Because calibration needs to be different in over-saturated conditions, there will be some discrepancy between the peak and non-peak directions in both the AM and PM. The rest of the driving behavior parameters were left unchanged for both arterial and freeway link types. Calibration results and adjusted driver behavior parameters are included in **Appendix F**. *(Please note that this report superseded the FDOT protocols for VISSIM that were released in the 2014 Traffic Analysis Handbook. Since FDOT used the ODOT protocols for developing theirs, then there is minimal difference.)*

Emergency stop distance during lane changes was left as the default value of 16.4 feet to model realistic behavior. The lane change beginning point for off-ramps along I-75 was set for a minimum of 5,280 feet. This means if a vehicle is exiting the freeway with a lane change, it would attempt to change into its destination lane at least 5,280 feet ahead of the diverge point if possible. This distance was determined based on an iterative process that calibrated the model best to the existing observed conditions.

This was the only driving behavior in the model that was altered from the default values in VISSIM. Other driving behaviors were tested during the calibration process and was determined that the combination of the adjusted lane changing criteria with the remaining default values best represented the existing condition for all directions during both the morning and afternoon peak periods.

Although most movements compared similarly to field observations, some movements did not. After further evaluation, the fluctuations were determined to be caused by the variation in the modeled traffic volumes that were altered due to balancing traffic volumes along the various intersections within the corridor. Even with some of these variations, the model was still determined to be calibrated properly for evaluating future conditions. Hence, the driving behavior and lane change parameters for future year alternatives are assumed to remain similar to the existing year parameters.

Calibration results are included in **Appendix F**. The VISSIM models were calibrated within acceptable parameters of MOE's after an iterative process. The models were run and then compared to field observations. **Tables 6-2** through **6-5** summarize the checklist of calibration criteria used as stated in the FHWA Toolbox Volume III.

**Table 6-2 Checklist of Calibration Criteria per FHWA Toolbox Volume III
– I-75 AM**

Hourly Flow Model vs. Observed (% of runs that met criteria)						
I-75 NB AM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
NB Off Ramp to Colonial Blvd	NB On Loop Ramp from EB Colonial Blvd		100%		-0.1%	
NB On Loop Ramp from EB Colonial Blvd	NB On Ramp from WB Colonial Blvd		100%		0.1%	
NB On Ramp from WB Colonial Blvd	NB Off Ramp at SR 82 (MLK Blvd)		100%		-0.5%	
NB Off Ramp at SR 82 (MLK Blvd)	NB On Ramp from SR 82 (MLK Blvd)		100%		-0.3%	
TOTAL					-0.2%	8.2%
I-75 SB AM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
SB Off Ramp to SR 82 (MLK Blvd)	SB On Ramp from SR 82 (MLK Blvd)		100%		-0.1%	
SB On Ramp from SR 82 (MLK Blvd)	SB Off Ramp to Colonial Blvd		100%		0.0%	
SB Off Ramp to Colonial Blvd	SB on Ramp from Colonial Blvd		100%		-0.1%	
TOTAL					0.0%	7.4%

**Table 6-3 Checklist of Calibration Criteria per FHWA Toolbox Volume III
– I-75 PM**

Hourly Flow Model vs. Observed (% of runs that met criteria)						
I-75 NB PM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
NB Off Ramp to Colonial Blvd	NB On Loop Ramp from EB Colonial Blvd		100%		0.6%	
NB On Loop Ramp from EB Colonial Blvd	NB On Ramp from WB Colonial Blvd			100%	-1.3%	
NB On Ramp from WB Colonial Blvd	NB Off Ramp at SR 82 (MLK Blvd)			100%	-1.1%	
NB Off Ramp at SR 82 (MLK Blvd)	NB On Ramp from SR 82 (MLK Blvd)		100%		-1.6%	
TOTAL					-0.9%	2.3%
I-75 SB PM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
SB Off Ramp to SR 82 (MLK Blvd)	SB On Ramp from SR 82 (MLK Blvd)		100%		-0.2%	
SB On Ramp from SR 82 (MLK Blvd)	SB Off Ramp to Colonial Blvd		100%		-0.2%	
SB Off Ramp to Colonial Blvd	SB on Ramp from Colonial Blvd		100%		-0.4%	
TOTAL					-0.3%	7.6%

**Table 6-4 Checklist of Calibration Criteria per FHWA Toolbox Volume III
– Colonial Boulevard AM**

Hourly Flow Model vs. Observed (% of runs that met criteria)						
Colonial Blvd EB AM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
Ortiz Ave	Rolfes Road		100%		-0.4%	
Rolfes Road	I-75 SB Ramps		100%		-0.3%	
I-75 SB Ramps	I-75 NB Ramps		100%		-1.0%	
I-75 NB Ramps	Forum Blvd		100%		-1.0%	
Forum Blvd	Dynasty Drive		100%		-0.5%	
TOTAL					-0.6%	30.5% ⁽¹⁾
Colonial Blvd WB AM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
Dynasty Drive	Forum Blvd		100%		-0.1%	
Forum Blvd	I-75 NB Ramps		100%		-0.7%	
I-75 NB Ramps	I-75 SB Ramps		100%		-0.3%	
I-75 SB Ramps	Ortiz Ave			100%	-0.6%	
TOTAL					-0.5%	-12.5%

(1) Difference is higher than 15% goal.

**Table 6-5 Checklist of Calibration Criteria per FHWA Toolbox Volume III
– Colonial Boulevard PM**

Hourly Flow Model vs. Observed (% of runs that met criteria)						
Colonial Blvd EB AM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
Ortiz Ave	Rolfes Road			100%	-5.5% ⁽¹⁾	
Rolfes Road	I-75 SB Ramps			100%	-4.3%	
I-75 SB Ramps	I-75 NB Ramps		100%		-5.0%	
I-75 NB Ramps	Forum Blvd		100%		-4.7%	
Forum Blvd	Dynasty Drive		100%		-4.3%	
TOTAL					-4.8%	-5.8%
Colonial Blvd WB AM		Flow < 700 vph (+/- 100)	Flow 700 - 2700 vph (+/- 15 %)	Flow > 2700 vph (+/- 400)	GEH < 5%	Total Travel Times Difference < 15%
Dynasty Drive	Forum Blvd		100%		-0.3%	
Forum Blvd	I-75 NB Ramps		100%		0.0%	
I-75 NB Ramps	I-75 SB Ramps		100%		-3.7%	
I-75 SB Ramps	Ortiz Ave		100%		-0.7%	
TOTAL					-1.4%	-8.7%

(1) Difference is higher than 5% goal.

There were two elements along Colonial Boulevard that did not technically meet FHWA calibration criteria, which are identified in **Tables 6-4** and **6-5**. The total travel time difference along Colonial Boulevard in the EB direction in the AM peak had nearly 30% faster travel times in the model than observed. This difference is higher than the 15% goal. The large difference is due to the traffic signals along Colonial Boulevard that delayed the travel runs when collecting the data compared to the average of all traveling vehicles in the

model, some of which did not stop at traffic signals. This was determined to be the best the model could be calibrated.

There was also one segment along Colonial Boulevard in the EB direction in the PM peak that had slightly higher than a 5.0% difference in GEH. This was determined to be mainly due to the congestion issues combined with the balancing of existing traffic volumes to have a slightly higher difference of 0.5% than is normally desirable. Since the rest of the links in this direction in the PM peak met the calibration criteria, this was determined acceptable for calibrating the EB PM peak direction.

The SYNCHRO model was calibrated as described in **Appendix G**.

All VISSIM models were simulated with ten unique runs. Discussion on the number of VISSIM microsimulation runs performed and comparison of VISSIM with SYNCHRO is included in **Appendix H**. Throughout this report, the analysis results are solely based on the VISSIM models. VISSIM 5.40-08 (Patch 8) was used for the analysis in this report. The VISSIM analysis was conducted for the existing, opening and the design years using traffic volumes for 15-minute intervals. It was agreed upon with FDOT District 1 that the interim year 2028 analysis will not be updated with 15-minute interval volumes. SYNCHRO was used for the existing analysis only. However, an attempt was made to perform the future build analysis using SYNCHRO but it resulted in multiple crashed models and inaccurate results. Thus, SYNCHRO results were not included in the report or in the appendices because SYNCHRO models are not appropriate as it has difficulties modeling the complexities of the continuous flow intersection, diverging diamond interchange configuration, superstreet, or various intersections with heavy volumes in close proximity.

SECTION 7 ANALYSIS OF EXISTING (2012) CONDITIONS

7.1 EXISTING YEAR TRAFFIC CONDITIONS

Existing link counts and turning movement counts were collected and provided by FDOT during the months of April and May 2012. The traffic counts were collected and adjusted as shown in **Section 4.0**. The detailed AM and PM peak existing traffic volumes developed are included in **Appendix D**. **Figure 4-2** illustrates the developed existing year 2012 AM and PM peak hour turning movement volumes. The evaluation of traffic conditions for the I-75 mainline freeway segments and the ramp merge/diverge locations at Colonial Boulevard and SR 82 was conducted using the Highway Capacity Software (HCS 2010) modules. The evaluation of the cross-street intersections on Colonial Boulevard and SR 82 was conducted using SYNCHRO 8.0 and VISSIM Version 5.40-08. The following sections provide a summary of the traffic operations analysis.

7.2 EXISTING YEAR OPERATIONAL ANALYSIS

7.2.1 Existing Year Freeway and Ramp Merge/Diverge Analysis

I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010. The results of the HCS analyses are summarized in **Table 7-1**. All the existing conditions HCS (freeway and ramp junction) analyses output worksheets are contained in **Appendix I**.

Table 7-1 Existing Year (2012) AM/PM HCS Freeway and Ramp Merge/Diverge Area Summary

Location	I-75 Freeway			I-75 Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
NB Freeway Segment S. of Colonial Boulevard	2303/3052	11.9/15.8	B/B			
NB Off-Ramp to Colonial Boulevard	2303/3052			623/964	18.7/23.7	B/C
NB On-Loop Ramp from eastbound Colonial Boulevard	1680/2088			601/760	12.3/15.7	B/B
NB On-Ramp from westbound Colonial Boulevard	2281/2848			85/99	15.6/18.6	B/B
NB Freeway Segment N. of Colonial Boulevard	2366/2947	12.3/15.3	B/B			
NB Off-Ramp to SR 82	2366/2947			306/396	18.4/21.9	B/C
NB On-Ramp from SR 82	2060/2551			527/439	18.0/19.7	B/B
NB Freeway Segment N. of SR 82	2587/2990	13.4/15.5	B/B			
SB Freeway Segment N. of SR 82	3082/2105	16.0/10.9	B/A			
SB Off-Ramp to SR 82	3082/2105			624/456	23.1/17.2	C/B
SB On-Ramp from SR 82	2458/1649			312/441	18.9/15.9	B/B
SB Freeway Segment N. of Colonial Boulevard	2770/2090	14.4/10.8	B/A			
SB Off-Ramp to Colonial Boulevard	2770/2090			1015/725	22.3/17.7	C/B
SB On-Ramp from Colonial Boulevard	1755/1365			722/962	18.0/18.0	B/B
SB Freeway Segment S. of Colonial Boulevard	2477/2327	12.9/12.1	B/B			

Based on the existing analysis, all the mainline freeway segments and the ramp merge/diverge junctions within the study area operate within the acceptable level of service.

7.2.2 Existing Year Ramp Terminal and Cross-Street Intersection Analysis

The ramp terminal intersections and cross-street intersections on Colonial Boulevard at Ortiz Avenue, I-75 southbound ramps, I-75 northbound off-ramp, Forum Boulevard and Dynasty Drive and along SR 82 at the southbound and northbound ramp intersections were analyzed for the existing AM and PM peak conditions using SYNCHRO and VISSIM. Both the ramp terminal intersections operate under signalized control at both Colonial Boulevard and SR 82. Existing signal timings obtained from Lee County were used to conduct the operational analysis. The VISSIM results of the analysis for the signalized and un-signalized intersections are summarized in **Table 7-2**. The SYNCHRO results for intersection analysis

are provided in **Table 7-3**. Copies of the VISSIM and SYNCHRO intersection analysis results and the signal timings received from Lee County are included in **Appendix J**.

Table 7-2 Existing Year (2012) AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	42.0/>80.0 ⁽¹⁾
Colonial Boulevard at Colonial Center Drive	Un-signalized	11.8/3.6
Colonial Boulevard at Rolfes Road	Un-signalized	2.1/15.9
Colonial Boulevard at I-75 SB Ramps	Signalized	30.7/18.7
Colonial Boulevard at I-75 NB Ramps	Signalized	15.6/20.3
Colonial Boulevard at Forum Boulevard	Signalized	29.8/31.0
Colonial Boulevard at Dynasty Drive	Un-signalized	1.5/0.1
SR 82 @ I-75 SB Ramps	Signalized	17.4/14.7
SR 82 @ I-75 NB Ramps	Signalized	14.9/17.5

(1) Excessive delay values.

Table 7-3 Existing Year (2012) AM/PM Intersection Analysis – SYNCHRO Summary

Intersection	Control Type	Overall Average Delay (sec/veh)	Overall LOS
Colonial Boulevard at Ortiz Avenue	Signalized	292.7/158.7	F/F
Colonial Boulevard at Colonial Center Drive	Un-signalized	- ⁽¹⁾ / - ⁽¹⁾	-/-
Colonial Boulevard at Rolfes Road	Un-signalized	- ⁽¹⁾ / - ⁽¹⁾	-/-
Colonial Boulevard at I-75 SB Ramps	Signalized	44.8/42.0	D/D
Colonial Boulevard at I-75 NB Ramps	Signalized	18.3/31.6	B/C
Colonial Boulevard at Forum Boulevard	Signalized	31.8/29.4	C/C
Colonial Boulevard at Dynasty Drive	Un-signalized	0.2/0.1	A/A
SR 82 @ I-75 SB Ramps	Signalized	18.5/15.1	B/B
SR 82 @ I-75 NB Ramps	Signalized	15.6/18.6	B/B

(1) Results not provided by SYNCHRO.

The results from the intersection analysis from both VISSIM and SYNCHRO show that with the exception of the intersection of Colonial Boulevard at Ortiz Avenue, all other

intersections operate at an acceptable level of service. Some of the minor approaches might not operate at an acceptable level of service (also, at the un-signalized locations), but the overall intersections meet the acceptable LOS D.

SECTION 8 ALTERNATIVE ANALYSIS

According to the approved Type 2 Categorical Exclusion approved by FHWA on 12/30/2002 and a System Interchange Modification Report (SIMR) approved on 8/8/2008, a Single Point Urban Interchange (SPUI) was the preferred alternative for the I-75 interchange at Colonial Boulevard that would have required replacement of the recently reconstructed I-75 bridges over Colonial Boulevard. Additionally, an Interchange Operational Analysis Report (IOAR) was prepared by Lee County and approved by FHWA on 7/20/2009. Per the approved IOAR, the recommended alternative was the Existing Interchange Configuration with Improvements including the added third-level flyover for the Colonial Boulevard expressway lanes. Also, this recommended alternative included six general use lanes, four special use lanes and auxiliary lanes on I-75; and, signal bypass lanes for right turn movements on the eastbound and westbound Colonial Boulevard approaches at the I-75 and Colonial Boulevard interchange. Extract from the System Interchange Modification Report (SIMR) approved on 8/8/2008 documenting Ultimate improvements along I-75 has been included in **Appendix A**. Recently in 2011, FDOT widened I-75 to six lanes and widened the existing bridges over Colonial Boulevard. Also, Lee County widened Colonial Boulevard to six lanes in 2012. In order to salvage the newly widened bridges, FHWA suggested to FDOT a reassessment of the study interchange may be appropriate. Five Alternatives including the no-build alternative were considered by FDOT District 1 at the interchange of I-75 and Colonial Boulevard and are listed below. These four preferred build alternatives were analyzed and presented to the Department.

- **No-Build Alternative:** The No-Build Alternative consists of the existing transportation network and any funded planned or programmed improvements open to traffic in the analysis year. The No-Build Alternative includes only those improvements that are elements of the MPO Transportation Improvement Program, the cost-feasible component of the MPO Long Range Transportation Plan (LRTP), the Department's Adopted Five-Year Work Program, local government comprehensive plans, or development mitigation improvement projects that are elements of approved development orders.

- TSM&O Alternative: There is no TSM&O alternative that was previously identified in a Planning or Traffic Operations Study based on coordination and discussion with FDOT District 1. Therefore, this alternative has not been analyzed as a part of this study as stated in the MLOU.
- Build Alternative 1: Single Point Urban Interchange (SPUI) Configuration – This alternative was accepted as the preferred alternative according to the Type 2 Categorical Exclusion (approved by FHWA on 12/30/2002) as a part of the I-75 PD&E Study from South of Bonita Beach Road to North of SR 78 and SIMR (8/8/2008).
- Build Alternative 2: Enhanced Eastbound to Northbound Loop Configuration – This alternative will maintain the existing “turbo” lane along with additional improvements at other intersections including the ramp terminal intersections.
- Build Alternative 3: Tight Urban Diamond Interchange (TUDI) – This alternative improves spacing between ramp terminal intersections and adjacent intersections.
- Build Alternative 4: Diverging Diamond Interchange (DDI) – This alternative eliminates on and off-ramp conflicts with through lanes while improving signal spacing.

However, along with the interchange improvement, the Colonial Boulevard traffic operation needs to be improved. Adjacent intersection traffic is not backing up into the interchange intersections, but the arterial operation does not meet level of service criteria. This has been achieved with additional improvements at Ortiz Avenue. Thus, Alternative 4 Improved which is a variation of Alternative 4 has been introduced where the DDI remained as the recommended interchange alternative but the Ortiz Avenue intersection was converted into a Continuous Flow Intersection (CFI) and the Forum Boulevard intersection was converted into a Superstreet (SS).

These alternatives were evaluated along with the interim and ultimate improvements along I-75 as identified in the I-75 PD&E Study dated November 2002. The interim improvement included widening of I-75 to 6 lanes within the IMR project limits which was completed in 2011. The approved ultimate (PD&E) concept included a ten-lane facility consisting of two

express lanes in each direction and three general use lanes in each direction from Colonial Boulevard to south of SR 82. In addition to these ultimate improvements, during the analysis phase, recommendations made as a part of the following studies were also taken into consideration as appropriate.

- I-75 from Colonial Boulevard to North of SR 78 – System Interchange Modification Report (SIMR) approved 8/8/2008 by FHWA.
- I-75 and Colonial Boulevard Interchange – Interchange Operational Analysis Report (IOAR) prepared by Lee County approved 7/20/2009 by FHWA.
- Draft Project Development Summary Report (PD&E Study by Lee County) for Colonial Boulevard (CR 884/SR 884) from West of McGregor Boulevard to east of I-75 dated February 2010.

SECTION 9 FUTURE CONDITIONS

In the design year 2038, the interchange of Colonial Boulevard with I-75 is proposed to be modified in order to improve the traffic operation at the I-75 ramp intersections with Colonial Boulevard. Operational analysis was conducted for the no-build and the build condition for the design year. The no-build analysis considered the existing geometry whereas the build analysis considered all the proposed interchange alternatives as stated below.

The build interchange alternatives that were analyzed as a part of this study are as follows:

- Alternative 1: Single Point Urban Interchange (SPUI) Configuration – This alternative was accepted as the preferred alternative according to the Type 2 Categorical Exclusion (approved by FHWA on 12/30/2002) as a part of the I-75 PD&E Study from South of Bonita Beach Road to North of SR 78 and SIMR (8/8/2008).
- Alternative 2: Enhanced Eastbound to Northbound Loop Configuration – This alternative will maintain the existing “turbo” lane along with additional improvements at other intersections including the ramp terminal intersections.
- Alternative 3: Tight Urban Diamond Interchange (TUDI) – This alternative improves spacing between ramp terminal intersections and adjacent intersections.
- Alternative 4: Diverging Diamond Interchange (DDI) – This is the recommended interchange alternative which improves signal spacing while eliminating the on and off-ramp conflicts with through lanes by removing the left turns from the main traffic stream.

However, along with the interchange improvement, the Colonial Boulevard traffic operation at the adjacent intersections needs to be improved. This has been achieved with additional improvements at Ortiz Avenue. Thus, Alternative 4 Improved which is a variation of Alternative 4 has been introduced where the DDI remained as the recommended interchange alternative but the Ortiz Avenue intersection was converted into a Continuous Flow Intersection (CFI) and the Forum Boulevard intersection was converted into a Superstreet (SS).

The recommended build interchange alternative was determined based on the screening of the above-mentioned alternatives based on the traffic operational analysis results and considering feasibility and cost of construction.

Also, for the design year build analysis, the approved Ultimate (PD&E) Concept along I-75 was considered. This includes a ten-lane facility comprised of two express lanes in each direction, three GUL in each direction from north of Daniels Parkway to north of SR 82, and auxiliary lanes between Colonial Boulevard and SR 82. These improvements were identified in the I-75 PD&E Study dated November 2002, System Interchange Modification Report (SIMR) approved on 8/8/2008, and in the Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. Capacity of 1600 vehicles per hour per lane on the special use lanes (SUL) was assigned to ensure that SUL will operate at LOS C per coordination between FDOT-District 1 and FDOT-Central Office. When the auxiliary lane is built, I-75 NB Off Ramp to SR 82 needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

SECTION 10 TRAVEL DEMAND FORECASTING

The travel demand forecasts for this IMR were developed using the future forecasts from the model. The Lee-Collier Model was approved and agreed upon by FDOT for use in this IMR Study. Subarea validation was performed for the base year 2007 of the Lee-Collier Model. The documentation on the subarea validation conducted has been included in **Appendix K**. These subarea adjustments/refinements were then applied to the future year 2035 of the Lee-Collier Model. Also, the documentation on the future model development has been included in **Appendix K**.

10.1 DEVELOPMENT OF FUTURE TRAFFIC

FDOT suggested that instead of using a growth rate for traffic projection, to use the 2035 model forecasts for the purpose of traffic forecasting along with the 2012 approved existing AADTs to account for variable growth rate within the study area.

Therefore, future AADTs and design hour volumes were developed using the FDOT District One recommended forecasting tool – FDOT TURNS5 spreadsheet with the existing 2012 AADTs, 2035 future model forecast and existing turning movement percentages. The future year AADT volumes for the no-build and the build scenarios are provided in **Figure 10-1**.

The output from the TURNS5 spreadsheet for the design hour volumes at the study intersections were adjusted for the purpose of balancing between intersections as appropriate and for reasonableness based on engineering judgment. The AM and PM peak hour volumes for the no-build and the build scenarios for opening year (2018), interim year (2028) and design year (2038) are provided in **Figure 10-2**, **Figure 10-3** and **Figure 10-4**.

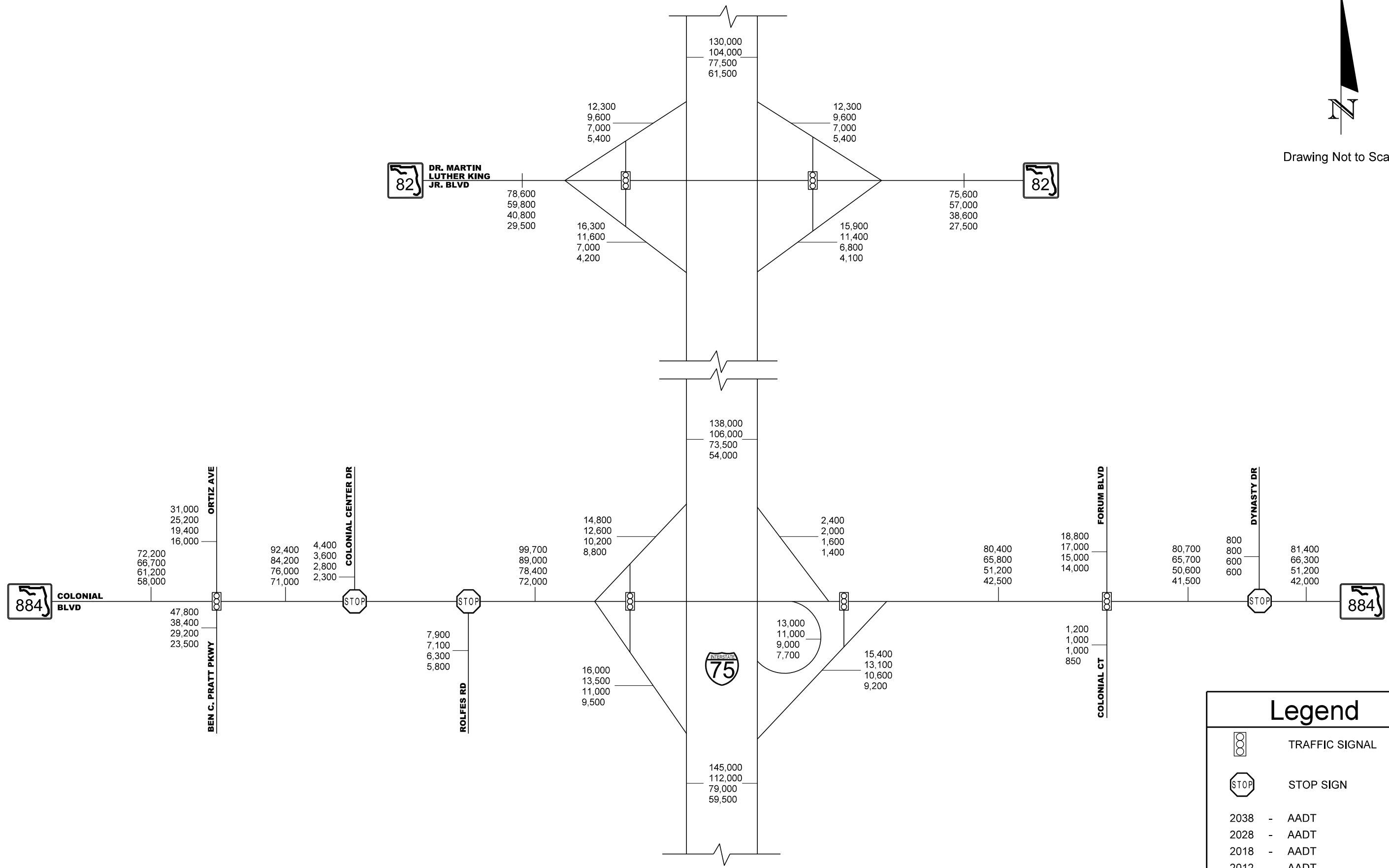
All the future year AADT volumes and the AM and PM design hour volumes were reviewed and approved by FDOT District 1 on March 1, 2013. **Appendix L** contains all the documentation regarding the development of future traffic volumes along with the TURNS5 spreadsheet input and output summaries.

Additional traffic volumes for 15-minute interval of the peak hours were also developed based on the variation of traffic over 15-minute intervals during the peak hours of the existing traffic counts for the existing year (2012), opening year (2018) and design year (2038). These volumes have been included in **Appendix L** also. These 15-minute interval volumes will be used later in the VISSIM analysis.

In this context, it should be noted that capacity of 1600 vehicles per hour per lane on the special use lanes (SUL) was assigned to ensure that SUL will operate at LOS C per coordination between FDOT-District 1 and FDOT-Central Office.



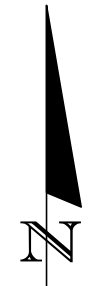
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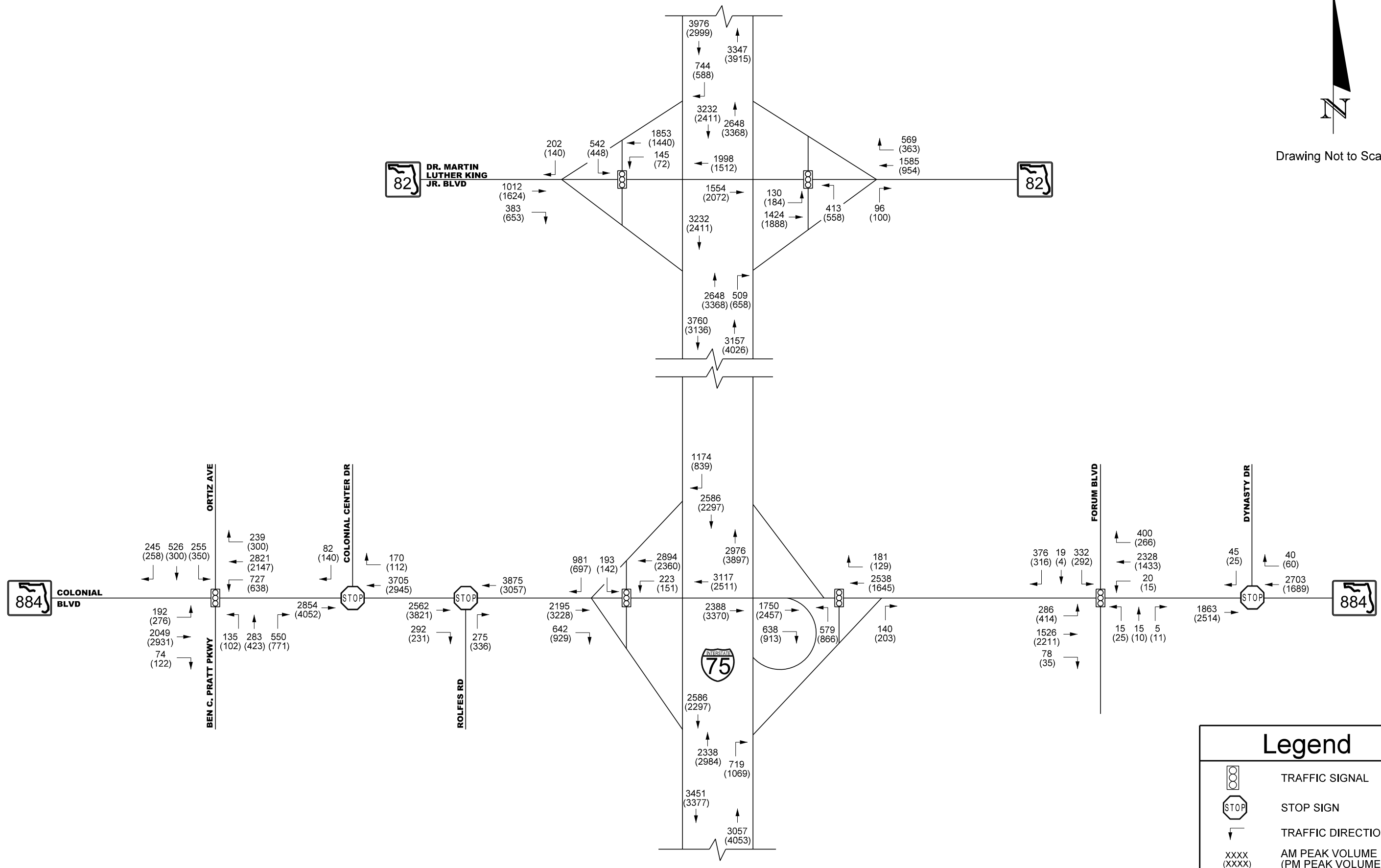
Legend	
	TRAFFIC SIGNAL
	STOP SIGN
2038	- AADT
2028	- AADT
2018	- AADT
2012	- AADT

I-75 at SR 884 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 10-1
Future No-Build and Build AADT



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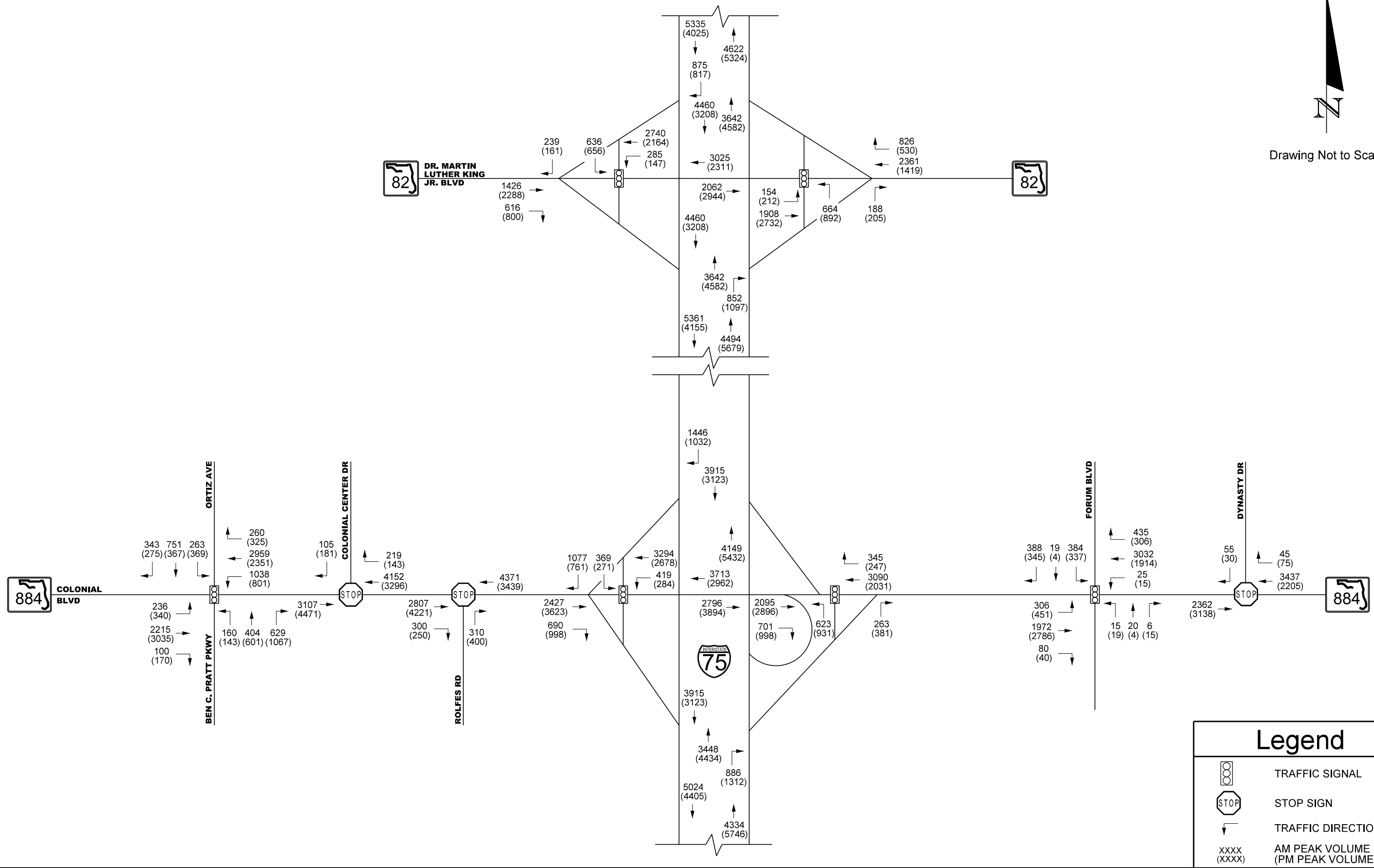
Legend	
	TRAFFIC SIGNAL
	STOP SIGN
	TRAFFIC DIRECTION
XXXX (XXXX)	AM PEAK VOLUME (PM PEAK VOLUME)

I-75 at SR 884 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 10-2
Opening Year 2018 Peak Hour Traffic Volumes



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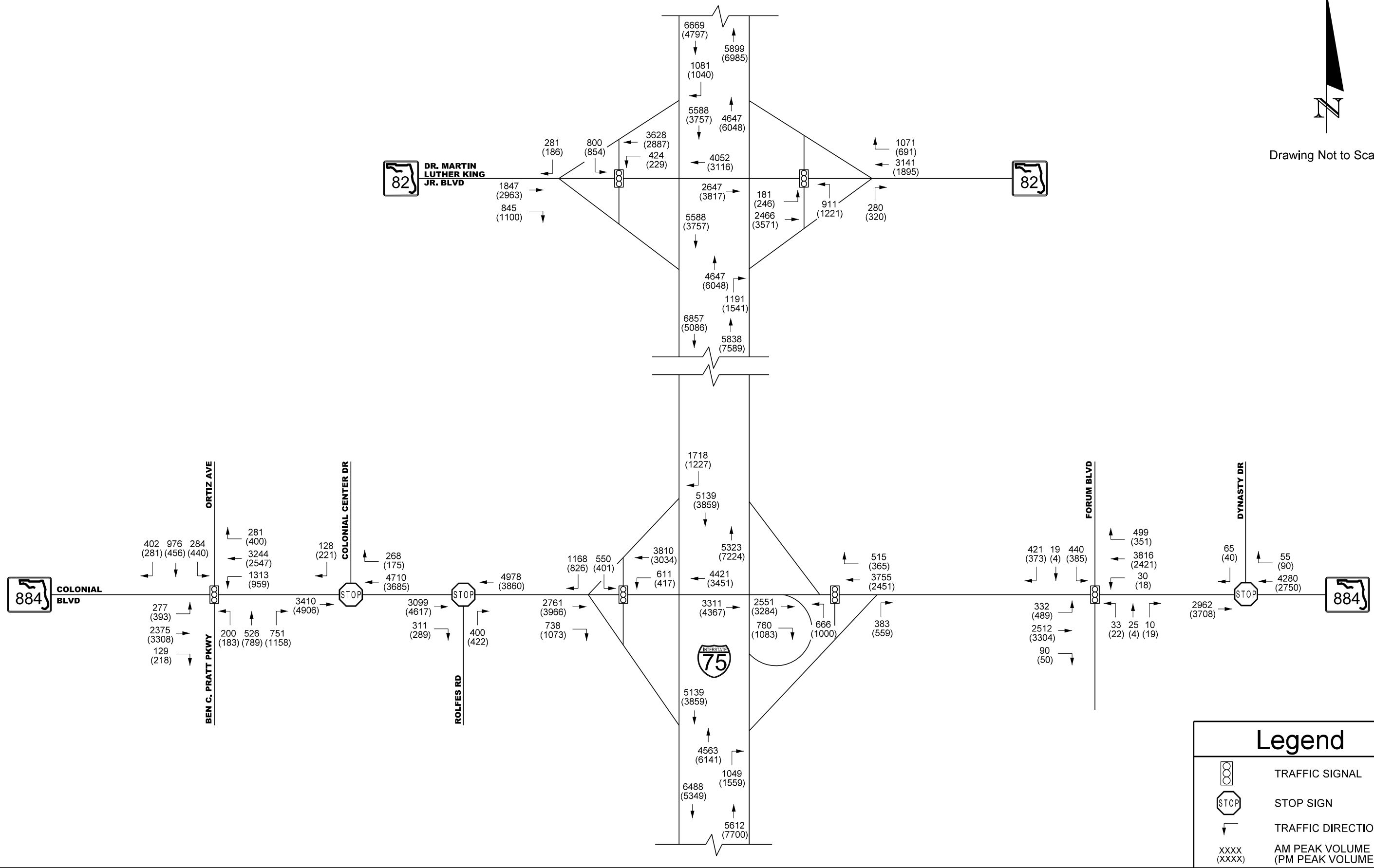
Legend	
	TRAFFIC SIGNAL
	STOP SIGN
	TRAFFIC DIRECTION
XXXX (XXXX)	AM PEAK VOLUME (PM PEAK VOLUME)

I-75 at SR 884 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 10-3
Interim Year 2028 Peak Hour Traffic Volumes



Drawing Not to Scale



I-75 at SR 84 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 10-4
Design Year 2038 Peak Hour Traffic Volumes

SECTION 11 EVALUATION OF ALTERNATIVES

11.1 DESIGN YEAR (2038) ANALYSIS

11.1.1 Design Year Traffic Volumes

Design year (2038) traffic volumes for the No-Build and the Build scenarios are the same and are shown in **Figure 10-4**.

11.1.2 Design Year No-Build Operational Analysis

The no-build geometry is same as the existing geometry shown in **Figure 4-4**.

11.1.2.1 Design Year No-Build Freeway and Ramp Merge/Diverge Analysis

I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010 for the No-Build scenario. The results of the HCS analyses are summarized in **Table 11-1**. All the no-build condition HCS (freeway and ramp junction) analyses output worksheets are contained in **Appendix M**.

Table 11-1 Design Year (2038) No-Build AM/PM HCS Freeway and Ramp Merge/Diverge Area Summary

Location	I-75 Freeway			I-75 Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
NB Freeway Segment S. of Colonial Boulevard	5612/7700	32.9/69.1	D/F			
NB Off-Ramp to Colonial Boulevard	5612/7700			1049/1559	36.0/51.4	D/F
NB On-Loop Ramp from eastbound Colonial Boulevard	4563/6141			760/1083	28.4/39.1	D/F
NB On-Ramp from westbound Colonial Boulevard	5323/7224			515/365	34.2/46.8	D/F
NB Freeway Segment N. of Colonial Boulevard	5838/7589	35.2/65.8	E/F			
NB Off-Ramp to SR 82	5838/7589			1191/1541	37.1/50.3	E/F
NB On-Ramp from SR 82	4647/6048			1252/937	36.6/41.3	E/F
NB Freeway Segment N. of SR 82	5899/6985	35.9/51.5	E/F			
SB Freeway Segment N. of SR 82	6669/4797	46.0/26.2	F/D			
SB Off-Ramp to SR 82	6669/4797			1081/1040	41.7/32.5	F/D
SB On-Ramp from SR 82	5588/3757			1269/1329	41.9/33.3	F/D
SB Freeway Segment N. of Colonial Boulevard	6857/5086	49.1/28.4	F/D			
SB Off-Ramp to Colonial Boulevard	6857/5086			1718/1227	43.5/34.2	F/D
SB On-Ramp from Colonial Boulevard	5139/3859			1349/1490	39.8/34.5	E/D
SB Freeway Segment S. of Colonial Boulevard	6488/5349	43.2/30.6	E/D			

The results of the HCS analysis shows that in the design year 2038 all the freeway segments and the ramp merge/diverge areas do not operate at an acceptable level of service in the AM peak period or the PM peak period or during both peak periods.

11.1.2.2 Design Year No-Build Ramp Terminal and Cross-Street Intersection Analysis

The ramp terminal intersections and cross-street intersections on Colonial Boulevard at Ortiz Avenue, I-75 southbound ramps, I-75 northbound off-ramp, Forum Boulevard and Dynasty Drive and along SR 82 at the southbound and northbound ramp intersections were analyzed for the design year AM and PM peak No-Build condition using VISSIM microsimulation software. The results of the analysis for the signalized and un-signalized intersections for the No Build scenario are summarized in **Table 11-2**. The output from VISSIM analyses are contained in **Appendix M**.

Table 11-2 Design Year (2038) No-Build AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	>80.0/>80.0 ⁽¹⁾
Colonial Boulevard at Colonial Center Drive	Un-signalized	>80.0/>80.0 ⁽¹⁾
Colonial Boulevard at Rolfes Road	Un-signalized	17.9/17.3
Colonial Boulevard at I-75 SB Ramps	Signalized	>80.0/>80.0 ⁽¹⁾
Colonial Boulevard at I-75 NB Ramps	Signalized	15.8/69.3
Colonial Boulevard at Forum Boulevard	Signalized	>80.0/>80.0 ⁽¹⁾
Colonial Boulevard at Dynasty Drive	Un-signalized	>80.0/>80.0 ⁽¹⁾
SR 82 @ I-75 SB Ramps	Signalized	>80.0/>80.0 ⁽¹⁾
SR 82 @ I-75 NB Ramps	Signalized	>80.0/77.8 ⁽¹⁾

(1) Excessive delay values.

The results from the intersection analysis show that with the exception of the un-signalized intersection of Colonial Boulevard at Rolfes Road, all the other study intersection experience excessive overall delay during one or both the peak periods. Even at Rolfes Road, the minor approach experiences excessive delay.

For the no-build alternative, as indicated in the table above, the Ortiz Avenue and the Forum Boulevard intersections fail in both the AM and PM peak periods with most turning movements experiencing high delays. Delay at the I-75 Northbound Ramp intersection is somewhat misleading because of the traffic not reaching the interchange due to the delays at the Ortiz Avenue and the Forum Boulevard intersection.

11.1.3 Design Year Build Operational Analysis

Build operational analysis was conducted for all the four build alternatives listed in **Section 6** of this report. The final recommended preferred alternative will be determined by the screening of the above-mentioned alternatives based on the results of the operational analysis, cost and feasibility of construction.

11.1.3.1 Design Year Build Freeway and Ramp Merge/Diverge Analysis

I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010 for the Build scenario for the different alternatives. The freeway along with the ramp merge/diverge configuration is consistent for Build Alternatives 1 (SPUI), 3 (TUDI) and 4 (DDI). However, the configuration is different for Build Alternative 2 (Enhanced Loop), which includes the northbound on loop ramp. Along I-75 for the design year, an additional auxiliary lane was added in each direction between Colonial Boulevard and SR 82. This allowed for smooth flow along I-75 reducing the impact of weaving between the two interchanges. Also, two Special Use Lanes (SUL) in each direction along I-75 were added in the design year for improved traffic operation along the mainline and at ramp merge/diverge junctions. These are consistent with the planned Ultimate improvements along I-75. The approved I-75 Ultimate (PD&E) Concept includes a ten-lane facility comprised of two express lanes in each direction, three GUL in each direction from north of Daniels Parkway to north of SR 82, and auxiliary lanes between Colonial Boulevard and SR 82. These improvements were identified in the I-75 PD&E Study dated November 2002, System Interchange Modification Report (SIMR) approved on 8/8/2008, and in the Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. When the auxiliary lane is built, I-75 NB Off Ramp to SR 82 needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

The results of the HCS analyses are summarized in **Table 11-3**. All the build condition HCS (freeway and ramp junction) analyses output worksheets are contained in **Appendix N**.

Table 11-3 Design Year (2038) Build for Alt 1, Alt 2, Alt 3 and Alt 4 AM/PM HCS Freeway and Ramp Merge/Diverge Area Summary

Location	I-75 Freeway			I-75 Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
NB Freeway Segment S. of Colonial Boulevard	5112/4800	28.6/26.2	D/D			
NB Off-Ramp to Colonial Boulevard	5112/4800			1049/1559	22.2/22.0	C/C
NB Freeway Segment N. of Colonial Boulevard	5338/4689	-/-(⁽¹⁾)	F/F			
NB On-Ramp from SR 82	4147/3148			1252/937	27.8/20.0	C/C
NB Freeway Segment N. of SR 82	5399/4085	21.3/15.9	C/B			
SB Freeway Segment N. of SR 82	4669/4797	18.2/18.7	C/C			
SB Off-Ramp to SR 82	4669/4797			1081/1040	20.3/20.8	C/C
SB Freeway Segment N. of Colonial Boulevard	4857/5086	-/-(⁽¹⁾)	F/F			
SB On-Ramp from Colonial Boulevard	3139/3859			1349/1490	23.2/28.1	C/D
SB Freeway Segment S. of Colonial Boulevard	4488/5349	24.0/30.6	C/D			

(1) Weaving Segment density not obtainable.

For the freeway and ramp merge/diverge analysis for Build Alternatives 1, 2, 3 and 4, traffic was transferred to SUL from General Use Lanes (GUL) as needed to achieve acceptable level of service. Five hundred (500) vehicles were assigned to the I-75 SUL during AM peak hour and 2900 vehicles were assigned to I-75 SUL during PM peak hour in the northbound direction. Two thousand (2000) vehicles were assigned to the I-75 SUL during AM peak hour in the southbound direction. These resulted in all segments along I-75 within study limits operating at an acceptable LOS D or better. The traffic assignment to I-75 SUL from the GUL during the peak hours is conservative as the SUL capacity is assumed to be 1600 vehicles/hour/lane to ensure that SUL will operate at LOS C. The freeway volumes shown in **Table 11-3** are the GUL traffic volumes (which is total directional freeway volume less the SUL traffic assignment).

The segment of I-75 between Colonial Boulevard and SR 82 has been identified to be a weaving segment in both northbound and southbound directions for all the Build alternatives. For the Build Alternative 2 which is the Enhanced Eastbound to Northbound Loop, the northbound I-75 on ramp from westbound Colonial Boulevard merges later than the other

alternatives. This reduces the length of the basic freeway segment between I-75 interchanges of Colonial Boulevard and SR 82, thereby creating a weaving segment.

The results of the HCS analysis shows that in the design year 2038 all the freeway segments and the ramp merge/diverge area will operate at an acceptable level of service D or better with the SUL, two in each direction, along I-75 and with one auxiliary lane in each direction along I-75 between the interchanges at Colonial Boulevard and SR 82. However, the weaving segments along I-75 between Colonial Boulevard and SR 82 in both northbound and southbound directions do not operate at an acceptable level of service. In this context, it should be noted that the VISSIM simulation runs indicate that the weave is operating acceptably. In performing the HCS weave analysis for this segment, a conservative approach was taken in assuming that there is no the ramp to ramp traffic from Colonial Boulevard to SR 82 and vice-versa which represents the worst-case scenario. If weaving becomes an issue in the future year 2038, possible recommendations would be: (a) adding a CD lane to eliminate weaving between Colonial Boulevard and SR 82; (b) providing a choice-lane from the right-most I-75 thru lane to exit onto the off ramp so that the traffic on I-75 does not necessarily have to weave into the right-most lane.

When the auxiliary lane is built, I-75 NB Off Ramp to SR 82 needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

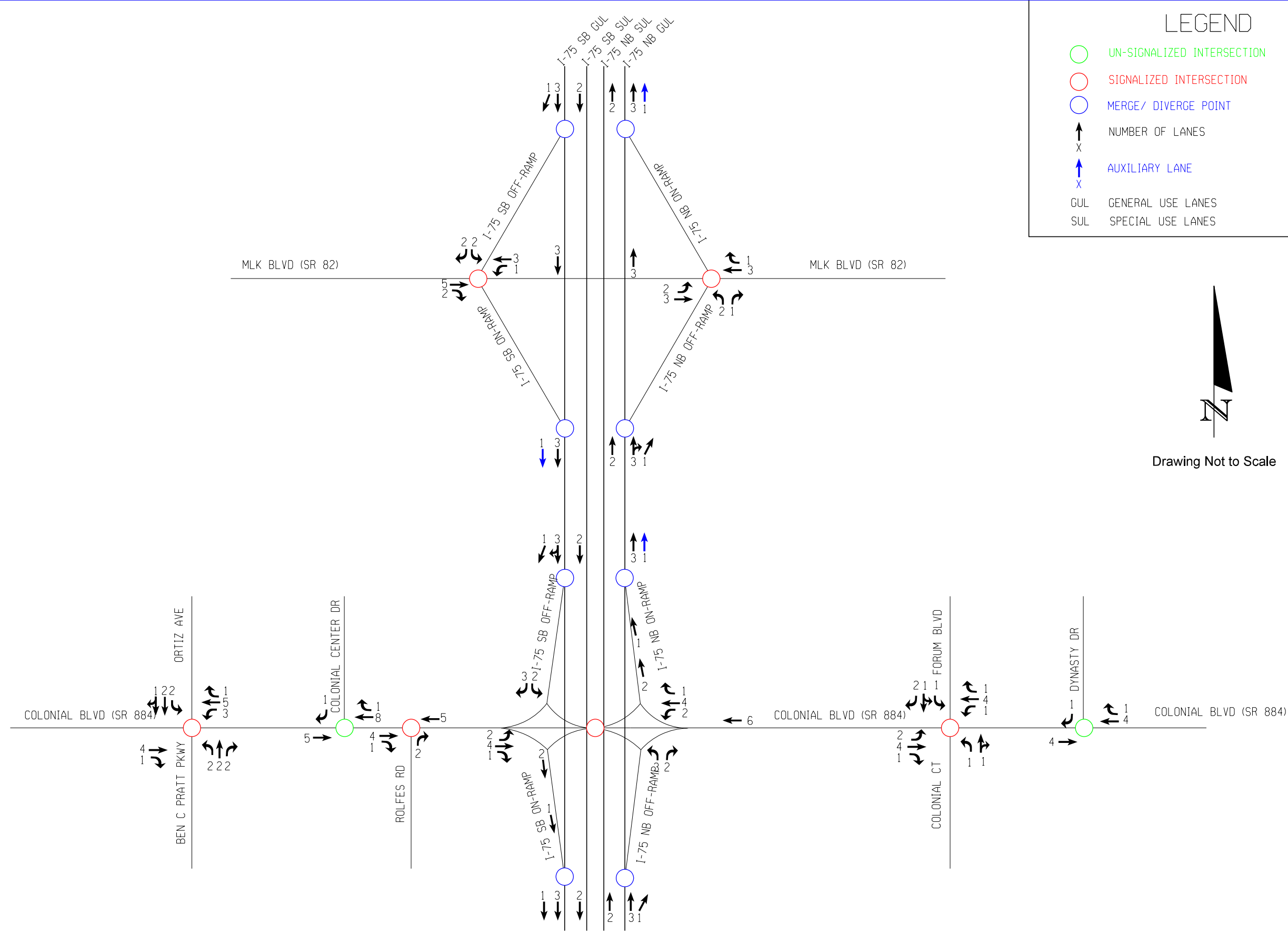
11.1.3.2 Design Year Build Ramp Terminal and Cross-Street Intersection Analysis

The ramp terminal intersections and cross-street intersections on Colonial Boulevard at Ortiz Avenue, I-75 southbound ramps, I-75 northbound off-ramp, Forum Boulevard and Dynasty Drive and along SR 82 at the southbound and northbound ramp intersections were analyzed for the design year AM and PM peak Build condition using VISSIM. All alternatives previously listed in Section 8.1 have been analyzed and the results are presented in this section in **Table 11-4** through **Table 11-17**. The output from VISSIM analyses are contained in **Appendix N**. The arterial level of service for Colonial Boulevard was calculated for all

build alternatives based on the travel time results obtained from VISSIM analysis using the Exhibit 17-2 of Highway Capacity Manual (HCM) 2010. The calculations for the arterial level of service are also included in **Appendix N**.

11.1.3.2.1 Build Alternative 1: Single Point Urban Interchange (SPUI)

This interchange alternative was originally the preferred alternative at I-75 and Colonial Boulevard according to the Type 2 Categorical Exclusion (approved by FHWA on 12/30/2002) as a part of the I-75 PD&E Study from South of Bonita Beach Road to North of SR 78 and SIMR (8/8/2008). This alternative was only examined for comparison purposes, since the SPUI is now considered infeasible due to the inability to have the proper geometric curves on the ramps for the left turn movements with the existing I-75 bridge structures over Colonial Boulevard. The geometry for the SPUI alternative is shown in **Figure 11-1**.



LEGEND

- UN-SIGNALIZED INTERSECTION
- SIGNALIZED INTERSECTION
- MERGE/ DIVERGE POINT
- ↑ NUMBER OF LANES
- ↑ X AUXILIARY LANE
- GUL GENERAL USE LANES
- SUL SPECIAL USE LANES



Drawing Not to Scale

I-75 at SR 884 (Colonial Blvd) IMR
 (FPN: 413065-1-32-01)

Figure 11-1
 Design Year 2038 Lane Geometry for Build Alternative 1:
 Single Point Urban Interchange (SPUI) at I-75 and Colonial Boulevard

**Table 11-4 Alternative 1: Single Point Urban Interchange – Design Year (2038)
Build AM/PM Intersection Analysis – VISSIM Summary**

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	56.5/75.0
Colonial Boulevard at Colonial Center Drive	Un-signalized	0.5/1.0
Colonial Boulevard at Rolfes Road	Signalized	12.4/12.0
Colonial Boulevard at I-75 Ramps	Signalized	42.0/47.1
Colonial Boulevard at Forum Boulevard	Signalized	34.4/28.8
Colonial Boulevard at Dynasty Drive	Un-signalized	1.6/0.2
SR 82 @ I-75 SB Ramps	Signalized	24.0/28.0
SR 82 @ I-75 NB Ramps	Signalized	24.5/30.2

Rolfes Road has been signalized under this build alternative as future traffic projections at the intersection of Rolfes Road and eastbound Colonial Boulevard would create high delays under stop control and queuing would extend into and along Dani Drive. Allowing a free right into a new lane along Colonial Blvd would create a weaving concern with Rolfes Road traffic that would want to continue to northbound I-75. That traffic would need to weave over four lanes in a short distance with large volumes of traffic. So that was deemed infeasible from a safety perspective.

The results in **Table 11-4** from the intersection analysis for this configuration show that the all intersections along Colonial Boulevard with the exception of Ortiz Avenue operate within acceptable delay.

**Table 11-5 Alternative 1: Single Point Urban Interchange (SPUI) – Design Year 2038
AM/PM Arterial Level of Service VISSIM Summary**

Roadway	Direction	Segment	Travel Speed (mph)	Build SPUI LOS ⁽¹⁾
Colonial Boulevard (SR 884)	EB	Ortiz Avenue to Rolfes Road	44.25/44.25	A/A
		Rolfes Road to I-75 Ramps	28.43/25.57	C/C
		I-75 Ramps to Forum Boulevard	36.87/42.07	B/B
		Forum Boulevard to Dynasty Drive	43.10/39.60	A/B
Colonial Boulevard (SR 884)	WB	Dynasty Drive to Forum Boulevard	11.93/14.73	F/F
		Forum Boulevard to I-75 Ramps	45.46/37.32	A/B
		I-75 Ramps to Ortiz Avenue	25.31/18.87	C/E

(1) LOS based on V/C ratio <=1 from Exhibit 17-2 of HCM 2010.

The travel times used to calculate travel speed along Colonial Boulevard were derived from the VISSIM model.

The results in **Table 11-5** from the arterial analysis for this configuration show that the segment along Colonial Boulevard between Dynasty Drive and Forum Boulevard and between I-75 Ramps and Ortiz Avenue do not operate at an acceptable level of service in the westbound direction during AM or PM or both peak periods.

This alternative was determined to be infeasible as it will require replacement of the recently widened I-75 bridges due to the inability to have the proper geometric curves on the ramps for the left turn movements with the existing I-75 bridge structures over Colonial Boulevard. Thus, the SPUI VISSIM model and the simulation were not refined further as discussed with FDOT District 1 on December 19, 2013.

11.1.3.2.2 Build Alternative 2: Enhanced Eastbound to Northbound Loop Configuration

This interchange alternative is similar in geometry to the existing configuration and will maintain the existing “turbo” lane along with additional improvements at other intersections including the ramp terminal intersections. The existing loop ramp from eastbound Colonial Boulevard to Northbound I-75 is widened to two lanes under this configuration. An additional bridge is needed over Colonial Boulevard to accommodate the two lane ramp improvement. The geometry for the Enhanced Loop alternative is shown in **Figure 11-2**.

Table 11-6 Alternative 2: Enhanced Eastbound to Northbound Loop – Design Year (2038) Build AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	59.1/>80.0 ⁽¹⁾
Colonial Boulevard at Colonial Center Drive	Un-signalized	39.8/55.1
Colonial Boulevard at Rolfes Road	Un-signalized	1.3/1.1
Colonial Boulevard at I-75 SB Ramps	Signalized	27.2/26.1
Colonial Boulevard at I-75 NB Ramps	Signalized	13.7/18.9
Colonial Boulevard at Forum Boulevard	Signalized	65.1/32.8
Colonial Boulevard at Dynasty Drive	Un-signalized	>80.0/1.3 ⁽¹⁾
SR 82 @ I-75 SB Ramps	Signalized	25.0/28.5
SR 82 @ I-75 NB Ramps	Signalized	25.0/30.2

(1) Excessive delay values.

It should be noted that the intersection of Colonial Boulevard and Rolfes Road has a much lower overall delay under un-signalized condition in this alternative when compared to the other alternatives due to the “free right” that is allowed in this case. The results in **Table 11-6** from the intersection analysis for this configuration show that the all intersections along Colonial Boulevard with the exception of Ortiz Avenue, Colonial Center Drive, Forum Boulevard and Dynasty Drive operate within an acceptable delay.

Table 11-7 Alternative 2: Enhanced Eastbound to Northbound Loop – Design Year 2038 AM/PM Arterial Level Of Service VISSIM Summary

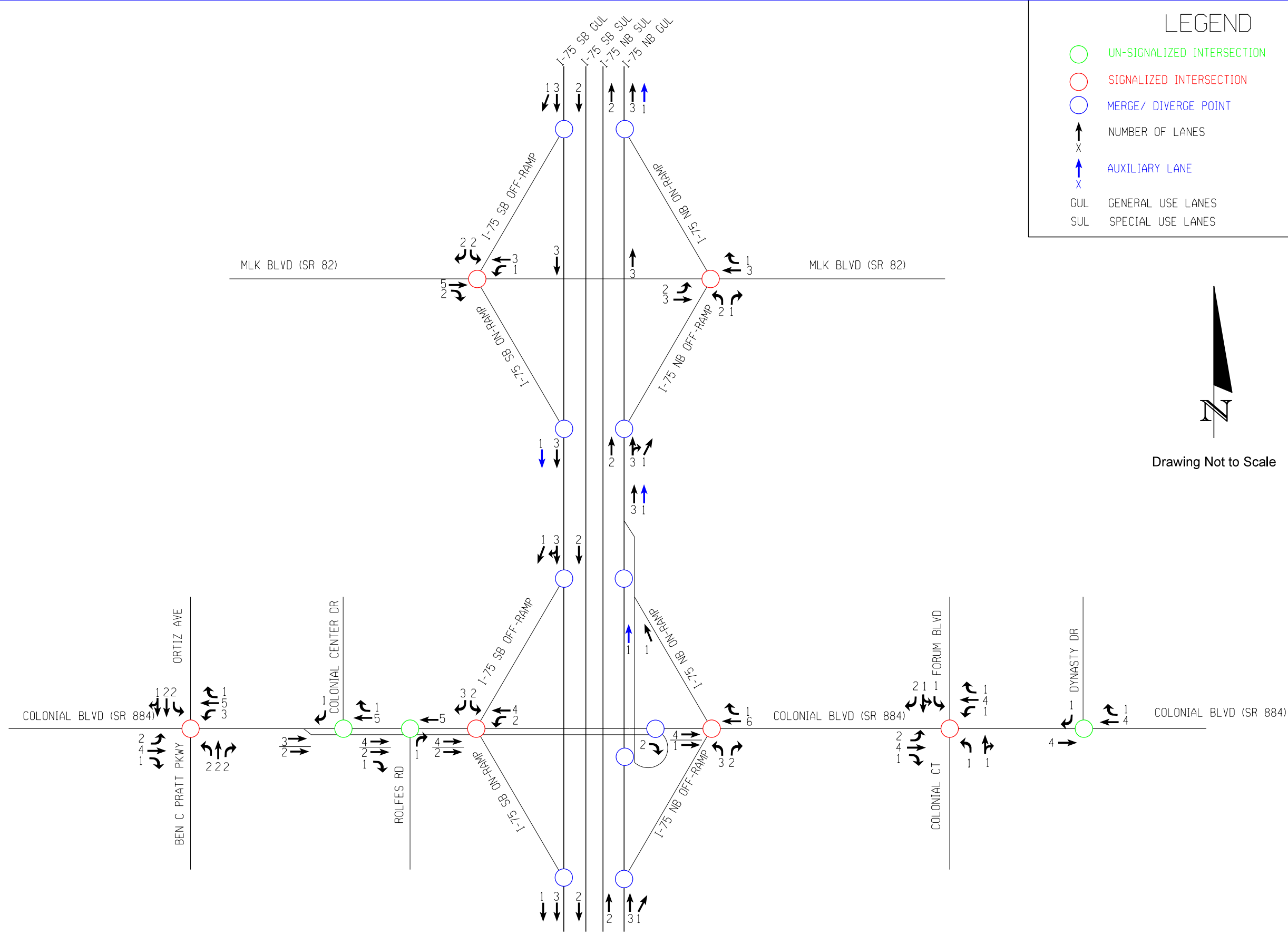
Roadway	Direction	Segment	Travel Speed (mph)	Build Enhanced Loop LOS ⁽¹⁾
Colonial Boulevard (SR 884)	EB	Ortiz Avenue to Rolfes Road	23.82/43.70	D/A
		Rolfes Road to I-75 SB Ramps	16.90/23.81	E/D
		I-75 SB Ramps to I-75 NB Ramps	22.65/38.55	D/B
		I-75 NB Ramps to Forum Boulevard	31.83/38.59	C/B
		Forum Boulevard to Dynasty Drive	42.81/42.10	A/B
Colonial Boulevard (SR 884)	WB	Dynasty Drive to Forum Boulevard	9.29/12.32	F/F
		Forum Boulevard to I-75 NB Ramps	34.15/30.52	B/C
		I-75 NB Ramps to I-75 SB Ramps	32.16/26.04	C/C
		I-75 SB Ramps to Ortiz Avenue	24.19/23.76	D/D

(1) LOS based on V/C ratio <=1 from Exhibit 17-2 of HCM 2010.

The travel times used to calculate travel speed along Colonial Boulevard were derived from the VISSIM model.

The results in **Table 11-7** from the arterial analysis for this configuration show that the segment along eastbound Colonial Boulevard between Rolfes Road and I-75 SB ramps do not operate at an acceptable level of service during the AM peak period and along westbound Colonial Boulevard between Dynasty Drive and Forum Boulevard do not operate at an acceptable level of service during both peak periods.

This alternative was determined to be infeasible from cost perspective as it will require new ramp bridge over Colonial Boulevard.



I-75 at SR 884 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 11-2
Design Year 2038 Lane Geometry for Build Alternative 2:
Enhanced Eastbound to Northbound Loop at I-75 and Colonial Boulevard

11.1.3.2.3 Build Alternative 3: Tight Urban Diamond Interchange (TUDI) Configuration

This interchange alternative improves spacing between ramp terminal intersections and adjacent intersections. This alternative eliminates the existing loop ramp from eastbound Colonial Boulevard to northbound I-75 and maximizes the number of lanes that can fit underneath the existing I-75 bridges. The northbound I-75 off-ramp is relocated to adjust the ramp terminal closer to the northbound I-75 on-ramp. The geometry for the Tight Urban Diamond Interchange (TUDI) alternative is shown in **Figure 11-3**.

Table 11-8 Alternative 3: Tight Urban Diamond Interchange (TUDI) – Design Year (2038) Build AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	57.6/>80.0 ⁽¹⁾
Colonial Boulevard at Colonial Center Drive	Un-signalized	50.7/58.4
Colonial Boulevard at Rolfes Road	Signalized	10.2/13.3
Colonial Boulevard at I-75 SB Ramps	Signalized	31.0/27.3
Colonial Boulevard at I-75 NB Ramps	Signalized	31.7/36.6
Colonial Boulevard at Forum Boulevard	Signalized	61.0/30.6
Colonial Boulevard at Dynasty Drive	Un-signalized	70.3/1.1
SR 82 @ I-75 SB Ramps	Signalized	25.1/35.0
SR 82 @ I-75 NB Ramps	Signalized	25.2/31.6

(1) Excessive delay values.

Rolfes Road has been signalized under this build alternative as future traffic projections at the intersection of Rolfes Road and eastbound Colonial Boulevard would create high delays under stop control and queuing would extend into and along Dani Drive. Allowing a free right into a new lane along Colonial Blvd would create a weaving concern with Rolfes Road traffic that would want to continue to northbound I-75. That traffic would need to weave over four lanes in a short distance with large volumes of traffic. So that was deemed infeasible from a safety perspective.

The results in **Table 11-8** from the intersection analysis for this configuration show that the all intersections along Colonial Boulevard with the exception of Ortiz Avenue, Colonial Center Drive, Forum Boulevard and Dynasty Drive operate within an acceptable delay.

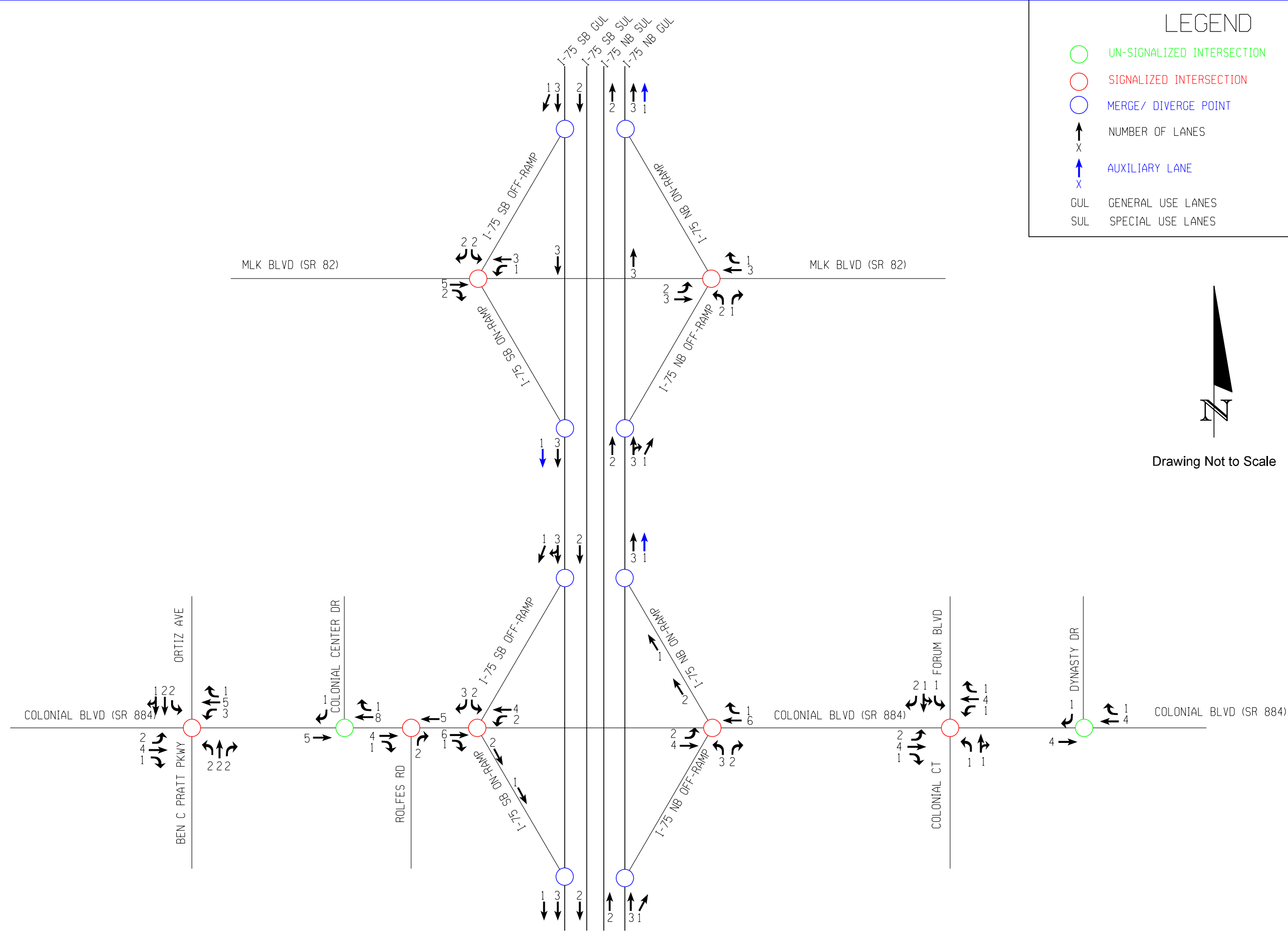
Table 11-9 Alternative 3: Tight Urban Diamond Interchange (TUDI) – Design Year 2038 AM/PM Arterial Level Of Service VISSIM Summary

Roadway	Direction	Segment	Travel Speed (mph)	Build TUDI LOS ⁽¹⁾
Colonial Boulevard (SR 884)	EB	Ortiz Avenue to Rolfes Road	39.65/42.77	B/A
		Rolfes Road to I-75 SB Ramps	14.67/21.73	F/D
		I-75 SB Ramps to I-75 NB Ramps	27.07/38.77	C/B
		I-75 NB Ramps to Forum Boulevard	35.79/37.80	B/B
		Forum Boulevard – Dynasty Drive	43.23/40.01	A/B
Colonial Boulevard (SR 884)	WB	Dynasty Drive to Forum Boulevard	10.64/13.87	F/F
		Forum Boulevard to I-75 NB Ramps	24.36/23.29	D/D
		I-75 NB Ramps to I-75 SB Ramps	34.85/35.53	B/B
		I-75 SB Ramps to Ortiz Avenue	27.53/21.02	C/D

(1) LOS based on V/C ratio <=1 from Exhibit 17-2 of HCM 2010.

The travel times used to calculate travel speed along Colonial Boulevard were derived from the VISSIM model.

The results in **Table 11-9** from the arterial analysis for this configuration show that the segment along eastbound Colonial Boulevard between Rolfes Road and I-75 SB ramps do not operate at an acceptable level of service during the AM peak period and along westbound Colonial Boulevard between Dynasty Drive and Forum Boulevard do not operate at an acceptable level of service during both peak periods.



LEGEND

- UN-SIGNALIZED INTERSECTION
- SIGNALIZED INTERSECTION
- MERGE/ DIVERGE POINT
- ↑ NUMBER OF LANES
- ↑ X AUXILIARY LANE
- GUL GENERAL USE LANES
- SUL SPECIAL USE LANES



Drawing Not to Scale

I-75 at SR 884 (Colonial Blvd) IMR
 (FPN: 413065-1-32-01)

Figure 11-3
 Design Year 2038 Lane Geometry for Build Alternative 3:
 Tight Urban Diamond Interchange (TUDI) at I-75 and Colonial Boulevard

Queue lengths for each lane group for the TUDI Alternative were derived from maximum queues obtained from VISSIM analysis performed. A comparison of queues for No Build and Build scenarios for the design year 2038 for the ramp terminal intersections is presented in **Table 11-10**. The queue lengths along the ramp at the ramp terminal intersections could impact the mainline and there should be no spillback from the ramps onto the I-75 mainline from safety and operational perspective. The ramp lengths for both northbound and southbound off ramps from I-75 mainline at Colonial Boulevard and at SR 82 ranges from approximately 1,450 feet to 2,000 feet.

Table 11-10 Alternative 3: Tight Urban Diamond Interchange (TUDI) – Design Year 2038 AM/PM Queue Length Calculations

Intersections	Existing Storage Length (feet per lane)	2038 No-Build Queue (feet per lane)	2038 TUDI Scenario Queue (feet per lane)
Colonial Boulevard @ I-75 Southbound Ramps			
Southbound Left	930	320/338	448/423
Southbound Right	930	13266/13265	734/637
Colonial Boulevard @ I-75 Northbound Ramps			
Northbound Left	1450	603/5485	380/859
Northbound Right	1450	331/390	389/868
SR 82 @ I-75 Southbound Ramps			
Southbound Left	525	5093/5105	518/548
Southbound Right	525	210/168	536/562
SR 82 @ I-75 Northbound Ramps			
Northbound Left	475	13695/13701	453/635
Northbound Right	475	13705/13709	291/506

The results indicated that queues will not exceed available storage under the build condition and will not impact the mainline. Also, the design year 2038 storage length calculations for the TUDI Alternative based on Plans Preparation Manual Volume 1 (Revised – July 1, 2013) for the signalized intersections and Florida Green Book May 2011 for the un-signalized intersections (Colonial Boulevard at Colonial Center Drive and Dynasty Drive) have been included in **Appendix N**. The recommended turn lane lengths have been rounded to the nearest 25 feet increment and are shown in **Table 11-11**.

Table 11-11 Alternative 3: Tight Urban Diamond Interchange (TUDI) – Design Year (2038) Build Recommended Turn Lane Lengths

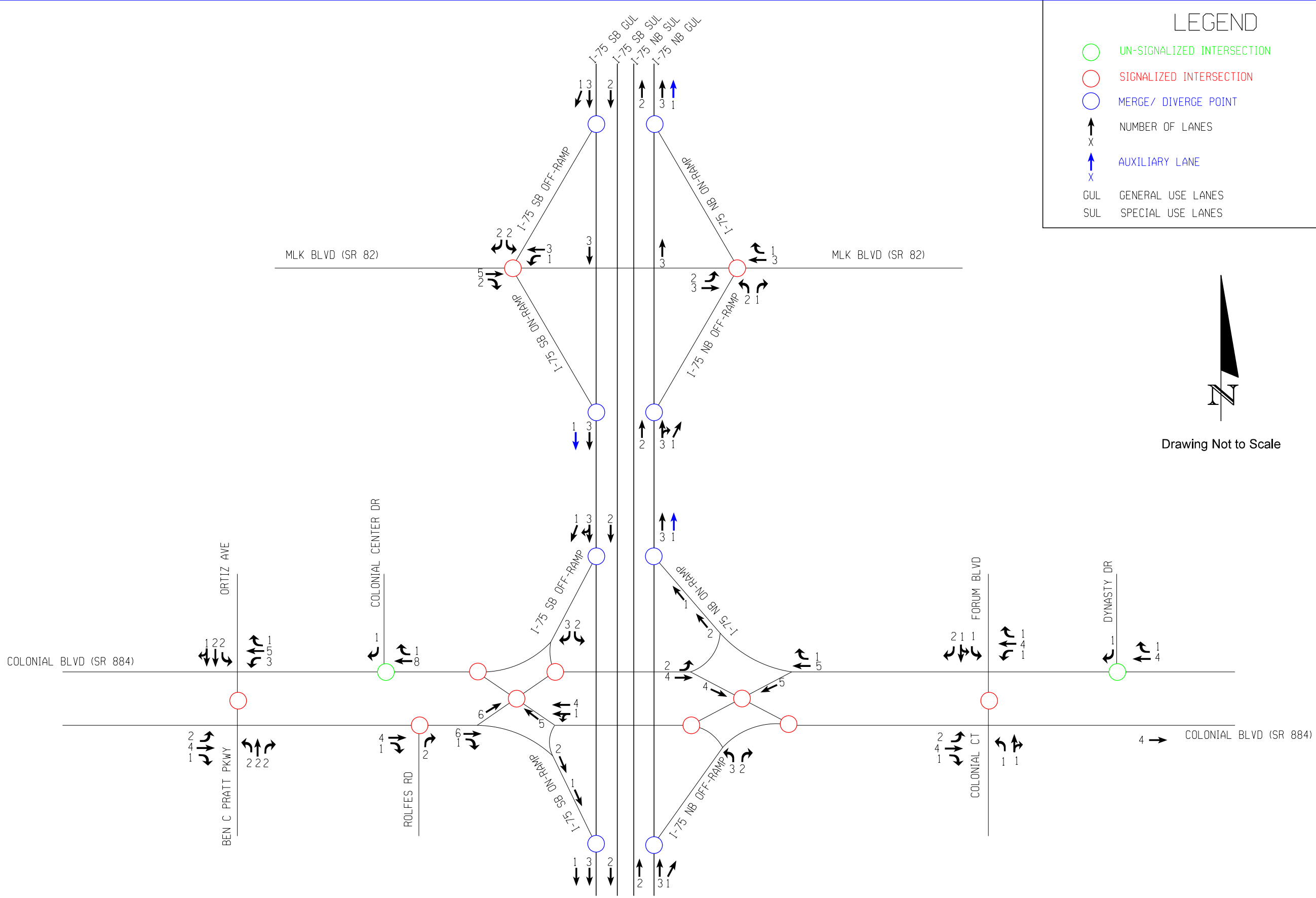
Colonial Boulevard Intersections	Approach	Movement	Recommended Turn Lane Length (feet)
Ortiz Avenue	Eastbound	Left	800
		Right	850
	Westbound	Left	1350
		Right	1375
	Northbound	Left	500
		Right	1850
	Southbound	Left	875
		Right	1250
Colonial Center Drive* (un-signalized)	Westbound	Right	475
	Southbound	Right	200
Rolfes Road	Eastbound	Right	1050
	Northbound	Right	850
I-75 SB Ramps	Eastbound	Right	3225
	Westbound	Left	1025
	Southbound	Left	850
		Right	1150
I-75 NB Ramps	Eastbound	Left	1750
	Westbound	Right	1550
	Northbound	Left	1100
		Right	950
Forum Boulevard	Eastbound	Left	925
		Right	475
	Westbound	Left	325
		Right	1500
	Northbound	Left	325
		Thru/Right	350
	Southbound	Left	800
		Right	775
Dynasty Drive* (un-signalized)	Westbound	Right	350
	Southbound	Right	75

* For un-signalized intersections, turn lane lengths estimated from *Florida Greenbook, May 2011*.

Signalized intersections based on *Plans Preparation Manual revised July 1, 2013*.

11.1.3.2.4 Build Alternative 4: Diverging Diamond Interchange (DDI) Configuration

This interchange alternative eliminates on and off-ramp conflicts with through lanes while improving signal spacing. This configuration has the unique feature of traffic driving on the left side of the road between the ramp terminals. In this alternative, six eastbound lanes along Colonial Boulevard approach the interchange from the west. The two left lanes are dedicated for the eventual ramp to northbound I-75. These six lanes cross five westbound Colonial Boulevard lanes at an at-grade signalized intersection. The eastbound traffic will then travel under the I-75 bridges on the north side. After emerging from under the bridges, the two left-most lanes will diverge to the northbound I-75 on ramp. The remaining four lanes continue east to a second signalized “crossover” intersection with five lanes of westbound Colonial Boulevard traffic. Six lanes along westbound Colonial Boulevard will approach the I-75 interchange from the east. The right-most lane will diverge to the northbound I-75 on ramp. The remaining five lanes continue through the east-side “crossover” intersection. Traffic will flow under the I-75 bridges on the south side. A ramp will emerge beyond the bridges where traffic heading to southbound I-75 can diverge onto the ramp on the left. The left-most lane will still contain through traffic. All five lanes will continue to the west-side “crossover” intersection. The northbound I-75 off ramp has three left-turn lanes and two right-turn lanes. These movements will diverge prior to reaching Colonial Boulevard. The southbound I-75 off ramp has two left-turn lanes and three right-turn lanes. These movements also will diverge prior to reaching Colonial Boulevard. All movements are fully signalized at the ramp terminal. The geometry for the Diverging Diamond Interchange alternative is shown in **Figure 11-4**.



LEGEND

- UN-SIGNALIZED INTERSECTION
- SIGNALIZED INTERSECTION
- MERGE/ DIVERGE POINT
- ↑ NUMBER OF LANES
- ↑ (blue) AUXILIARY LANE
- GUL GENERAL USE LANES
- SUL SPECIAL USE LANES



Drawing Not to Scale

I-75 at SR 884 (Colonial Blvd) IMR
 (FPN: 413065-1-32-01)

Figure 11-4
 Design Year 2038 Lane Geometry for Build Alternative 4:
 Diverging Diamond Interchange (DDI) at I-75 and Colonial Boulevard

Table 11-12 Alternative 4: Diverging Diamond Interchange (DDI) – Design Year (2038) Build AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	55.2/>80.0 ⁽¹⁾
Colonial Boulevard at Colonial Center Drive	Un-signalized	45.9/66.8
Colonial Boulevard at Rolfes Road	Signalized	12.9/12.8
Colonial Boulevard at I-75 SB Ramps	Signalized	22.2/26.5
Colonial Boulevard at I-75 NB Ramps	Signalized	22.2/20.1
Colonial Boulevard at Forum Boulevard	Signalized	73.7/31.2
Colonial Boulevard at Dynasty Drive	Un-signalized	91.0/1.3 ⁽¹⁾
SR 82 @ I-75 SB Ramps	Signalized	25.1/33.6
SR 82 @ I-75 NB Ramps	Signalized	21.7/30.9

(1) Excessive delay values.

Rolfes Road has been signalized under this build alternative as future traffic projections at the intersection of Rolfes Road and eastbound Colonial Boulevard would create high delays under stop control and queuing would extend into and along Dani Drive. Allowing a free right into a new lane along Colonial Blvd would create a weaving concern with Rolfes Road traffic that would want to continue to northbound I-75. That traffic would need to weave over four lanes in a short distance with large volumes of traffic. So that was deemed infeasible from a safety perspective.

The results in **Table 11-12** from the intersection analysis for this configuration show that the all intersections along Colonial Boulevard with the exception of Ortiz Avenue, Colonial Center Drive, Forum Boulevard and Dynasty Drive operate within an acceptable delay.

**Table 11-13 Alternative 4: Diverging Diamond Interchange (DDI) – Design Year 2038
AM/PM Arterial Level Of Service VISSIM Summary**

Roadway	Direction	Segment	Travel Speed (mph)	Build DDI LOS ⁽¹⁾
Colonial Boulevard (SR 884)	EB	Ortiz Avenue to Rolfes Road	42.61/39.90	A/B
		Rolfes Road to I-75 SB Ramps	20.51/16.45	D/E
		I-75 SB Ramps to I-75 NB Ramps	33.76/35.38	B/B
		I-75 NB Ramps to Forum Boulevard	21.77/36.81	D/B
		Forum Boulevard to Dynasty Drive	40.24/38.10	B/B
Colonial Boulevard (SR 884)	WB	Dynasty Drive to Forum Boulevard	9.14/12.44	F/F
		Forum Boulevard to I-75 NB Ramps	22.35/23.96	D/D
		I-75 NB Ramps to I-75 SB Ramps	23.16/22.75	D/D
		I-75 SB Ramps to Ortiz Avenue	26.94/23.26	C/D

(1) LOS based on V/C ratio <=1 from Exhibit 17-2 of HCM 2010.

The travel times used to calculate travel speed along Colonial Boulevard were derived from the VISSIM model.

The results in **Table 11-13** from the arterial analysis for this configuration show that the segment along eastbound Colonial Boulevard between Rolfes Road and I-75 SB ramps do not operate at an acceptable level of service during PM peak period and along westbound Colonial Boulevard between Dynasty Drive and Forum Boulevard do not operate at an acceptable level of service during both peak periods.

11.1.3.3 Screening of Build Alternatives

Based on the analysis all alternatives have acceptable LOS with the exception at the intersection of Colonial Boulevard at Ortiz Avenue, Colonial Center Drive, Forum Boulevard and Dynasty Drive. The average delay is similar in each feasible alternative for the I-75 SB Ramps intersection in both the AM and PM peaks. However, the SPUI had higher average delay for the I-75 Ramps intersection, which was worse than any other alternative. Also, the SPUI would require the replacement of the recently widened I-75 bridges due to the inability to have the proper geometric curves on the ramps for the left turn movements with the existing I-75 bridge structures over Colonial Boulevard. For the I-75 NB Ramps intersection, the Enhanced Loop alternative has the least delay during both the peaks while compared to the other alternatives. In the PM peak, the average delay for the I-75 NB Ramps

intersection for the TUDI alternative is at LOS D. Also, the TUDI interchange configuration does have the highest delay out of the three build alternatives at the ramp terminal intersections.

The comparison of results between the Enhanced Loop and DDI alternatives at the ramp intersections are similar. However, the Enhanced Loop has a lower delay compared to the DDI at the I-75 NB Ramps intersection. Based on these results, the Enhanced Loop alternative appears to be the better option. However, there are other factors that make the DDI more feasible. First, the DDI would be significantly less costly than the Enhanced Loop interchange configuration because the later would require an additional ramp bridge to accommodate two lane ramp improvement over Colonial Boulevard. Secondly, the DDI would likely be the safer alternative due to the reduction of conflict points and not having a loop ramp, which tends to have more crashes than straight ramps (according to Highway Safety Manual *HSM*). And, the third reason is that the DDI could perform better if the adjacent signalized intersections took advantage of some of the features of the DDI.

Although the different interchange alternatives are operationally feasible, the DDI will still reduce the overall delay more than the remaining alternatives. The DDI also operates better with the superstreet at Forum, because signals can be synchronized like one-way streets through both the DDI and superstreet. This is not possible with the other alternatives.

Considering the cost, the SPUI and the Enhanced Loop alternatives are screened out due to the requirement of replacement or construction of bridges. However, the cost between constructing the DDI and TUDI are similar. But in the long term, the Diverging Diamond Interchange (DDI) provides a more flexible alternative for the left-turn capacity to be increased for traffic entering the on-ramps by developing a shared lane in either direction without replacing the existing bridge structure. This is not possible with the TUDI. Thus, the DDI will provide additional future capacity than the TUDI and future traffic beyond the design year will be better serviced by the DDI. Maintenance costs will be similar between a DDI and TUDI, but both would be less than the Enhanced Loop alternative due to fewer ramps/pavement.

From a safety perspective, DDI should reduce both the overall amount of crashes as well as the severity of crashes compared to the other alternatives. The TUDI has twenty-six overall conflict points, with thirteen conflict points concentrated at each of the ramp terminals. The enhanced loop reduces four conflict points at the NB ramp terminal but adds one conflict point at the diverge for the ramp, giving twenty-three overall conflict points; thirteen at the SB ramp, nine at the NB ramp, and one at the loop ramp. The enhanced loop also introduces another conflict point on NB I-75 with the loop ramp merge. Also the Enhanced Loop alternative has a larger change in speeds between the mainline and ramp as well as more limited sight distance. Studies have shown that loop ramps tend to have more crashes than straight ramps (according to the Highway Safety manual HSM). The DDI, on the other hand, only has fourteen conflict points. These conflict points are spread out through the interchange, which means that a driver only needs to navigate through one potential conflict at a time. Also, there are only two crossing conflict points in the entire DDI, one at each crossover intersection. This compares to ten crossing conflict points in the TUDI and eight in the Enhanced Loop. These crossing conflicts provide more opportunity for more severe crashes.

Therefore, the Diverging Diamond Interchange (DDI) configuration is recommended as the build alternative for the I-75 and Colonial Boulevard study interchange.

However, the key to improving the traffic operation along this study corridor of Colonial Boulevard in addition to the interchange improvement is with additional improvements at Ortiz Avenue. While grade separation may improve operations, this would be very costly and could geometrically prohibit some movements; so other more innovative at-grade options were considered. The intersection of Colonial Boulevard and Forum Boulevard will also require additional improvements. Thus, Alternative 4 Improved which is a variation of Alternative 4 was developed where the DDI remained as the recommended interchange alternative but the Ortiz Avenue intersection was converted into a Continuous Flow Intersection (CFI) and the Forum Boulevard intersection was converted into a Superstreet (SS).

11.1.3.3.1 Build Alternative 4 Improved: Diverging Diamond Interchange (DDI) Configuration with Continuous Flow Intersection (CFI) at Ortiz Avenue and Superstreet (SS) at Forum Boulevard (CFI-DDI-SS)

The geometry for this alternative is shown in **Figure 11-5**.

A Continuous Flow Intersection (CFI) is a unique design where some or all of the left turn movements begin before the crossing intersection. In the case of the Ortiz Avenue intersection, the left turn movements from Colonial Boulevard in each direction were displaced. Left turning traffic begins prior to the intersection, in both time and space. The left turning traffic will cross over the opposing through traffic on to a short access road that runs parallel to Colonial Boulevard until it ends at Ortiz Avenue. When the traffic reaches Ortiz Avenue, the green traffic phase will begin. This now allows the Colonial Boulevard through traffic to flow concurrently in both directions with the left turning traffic in both directions without any conflicts. As the through movement vehicles approach the crossover intersection, that phase will change to green as well. Therefore, by using time and space to take advantage of signal synchronization, the CFI allows all movements to have “continuous flow” through the entire CFI once any green phase begins. The major advantage of the CFI is left turning traffic can be eliminated as a critical movement for the signal timing. This is especially useful for the Ortiz Avenue intersection, where in the AM peak for the design year, there are projected to be over 1,300 left turning vehicles from westbound Colonial Boulevard to southbound Ortiz Avenue. Another advantage of the CFI is that there are fewer signal phases at the Ortiz Avenue intersection, which can reduce the cycle length and allow more green time for the through movements.

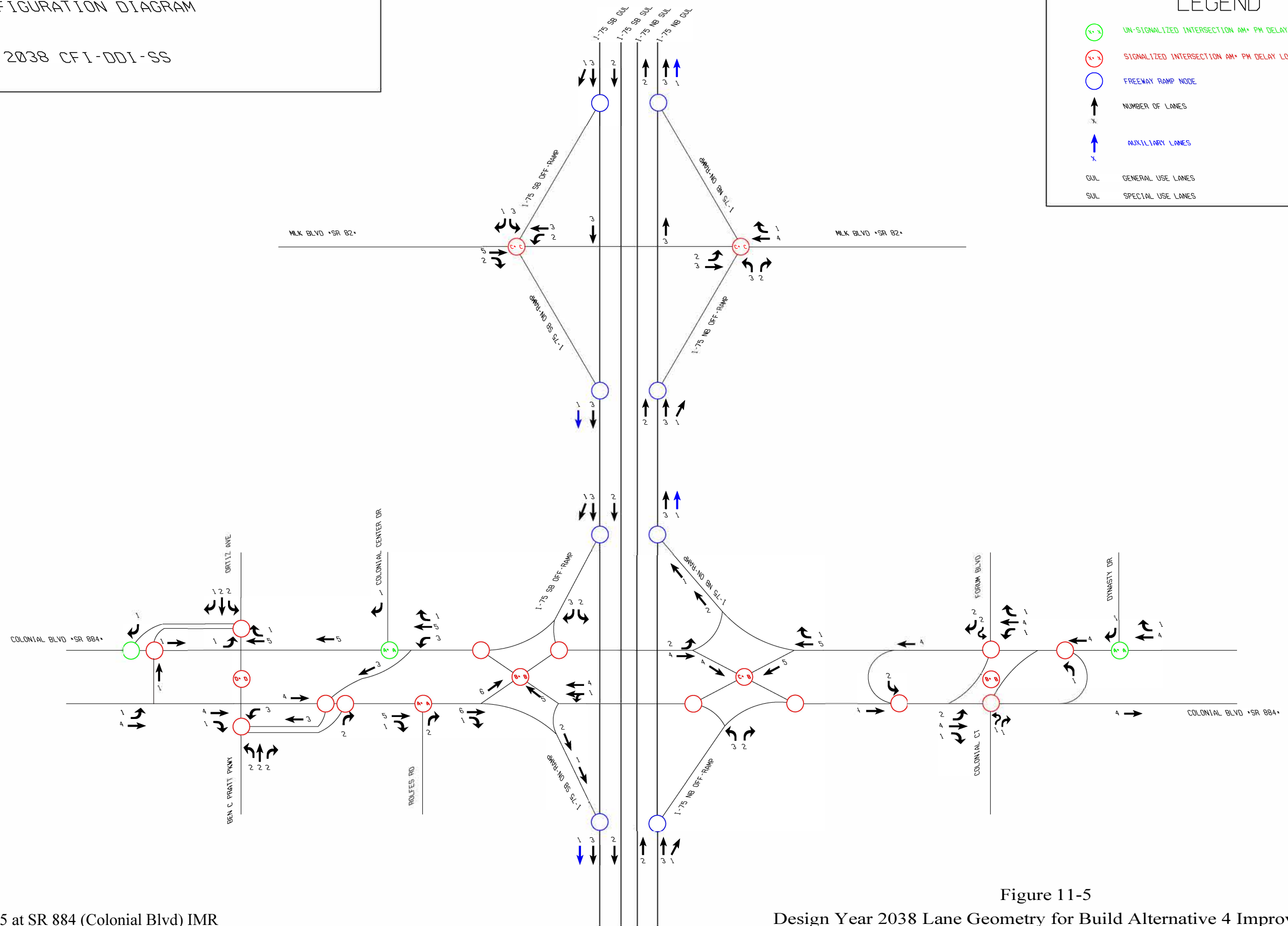
A Superstreet (SS) was developed for the Forum Blvd intersection. A SS is an innovative intersection form that reduces signal phases and improves traffic flow for the major direction. In a SS, the major roadway, in this case Colonial Boulevard is allowed to make all the movements directly at the minor roadway, in this case Forum Boulevard. However, from the minor roadway, traffic will be forced to make a right turn on to the major roadway with no direct through or left turn movements being allowed. To complete those movements, traffic will need to make a U-turn at a median opening east and west of the intersection and then return to the minor roadway intersection to complete the desired movement.

LANE CONFIGURATION DIAGRAM

2038 CFI-DDI-SS

LEGEND

- (X X) UN-SIGNALIZED INTERSECTION AM+ PM DELAY LOS
- (X X) SIGNALIZED INTERSECTION AM+ PM DELAY LOS
- FREEWAY RAMP NODE
- ↑ NUMBER OF LANES
- ↑ X AUXILIARY LANES
- GUL GENERAL USE LANES
- SUL SPECIAL USE LANES



I-75 at SR 884 (Colonial Blvd) IMR
(FPN: 413065-1-32-01)

Figure 11-5
Design Year 2038 Lane Geometry for Build Alternative 4 Improved:
Diverging Diamond Interchange (CFI-DDI-SS) at I-75 and Colonial Boulevard

All movements are signalized in the SS. Operationally there are two major advantages of the SS. First, all the traffic signals have just two phases. This allows a higher percentage of green time for each phase as well as a reduction of the overall cycle length. The second advantage is that the signals in the eastbound direction are independent from the signals in the westbound direction. This results in each direction acting as one-way streets that can have “perfect” signal progression.

The advantages of having a CFI and SS on the opposite sides of the DDI become more apparent. The reduction of signal phases at each intersection can result in a shorter cycle length. The one-way roadway characteristics of the SS also compliment the one-way roadway characteristics of the DDI. This allows for the maximum green bandwidth possible between all the intersections in each direction.

The results of the intersection analysis for this Alternative 4 Improved are summarized in **Table 11-14**.

Table 11-14 Alternative 4 Improved: Continuous Flow Intersection-Diverging Diamond Interchange-Superstreet (CFI-DDI-SS) – Design Year (2038) Build AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	39.2/43.1
Colonial Boulevard at Colonial Center Drive	Un-signalized	2.8/1.8
Colonial Boulevard at Rolfes Road	Signalized	10.1/7.1
Colonial Boulevard at I-75 SB Ramps	Signalized	19.5/18.1
Colonial Boulevard at I-75 NB Ramps	Signalized	19.5/19.1
Colonial Boulevard at Forum Boulevard	Signalized	16.7/16.4
Colonial Boulevard at Dynasty Drive	Un-signalized	13.2/2.9
SR 82 @ I-75 SB Ramps	Signalized	24.4/29.6
SR 82 @ I-75 NB Ramps	Signalized	25.8/30.9

The results from the intersection analysis for this configuration show that the all intersections within the study limits operate within an acceptable delay. Also as compared with the Alternative 4 without the CFI and SS, the delay at all intersections along Colonial Boulevard was reduced.

Alternative 4 Improved that has been selected as the preferred alternative significantly improved the traffic flow through the Colonial Boulevard corridor. The Ortiz Avenue intersection is projected to operate within an acceptable delay in 2038 in both the AM and PM peak periods. All other intersections within the study corridor will operate with lower delay in 2038. Traffic flow will significantly improve through the corridor. Signal coordination between the CFI, DDI and SS are simplified due to the reduction of signal phases and the characteristics of the designs that act more like one-way roadway pairs.

Safety will likely be improved too throughout the corridor. The CFI, DDI and SS have all shown the ability to reduce the amount of crashes and severity of crashes compared to other alternatives mainly due to the reduction of conflict points. Driver confusion is generally not an issue in these designs, which is evidenced in the various CFIs, DDIs and Superstreets already in operations.

Bicycles and pedestrians will benefit from these designs as well. The DDI and SS have fewer lanes to cross at the intersection and less conflicting movements. The CFI also reduces conflicting movements and can also shorten intersection crossings when designed appropriately.

11.1.3.4 Design Year Arterial Level of Service for Colonial Boulevard

Arterial analysis was performed to determine the performance of Colonial Boulevard from Ortiz Avenue to Dynasty Drive in a coordinated signalized intersection system. The arterial level of service was calculated based on the travel time results obtained from VISSIM analysis using the Exhibit 17-2 of Highway Capacity Manual (HCM) 2010. The arterial level of service has only been computed for the build condition for which volume to capacity ratio is less than or equal to 1.0. The arterial level of service was not computed for the no-

build condition as for volume to capacity greater than 1.0 condition, arterial level of service is automatically F. The traffic that is backed up at the Ortiz Avenue and I-75, does not enter the network in the no-build condition, thus the arterial level of service for Colonial Boulevard for the no-build condition might appear to be better than the build level of service.

The arterial level of service for Colonial Boulevard for the Alternative 4 Improved is shown in **Table 11-15** below. The travel time results and the arterial level of service calculations are also included in **Appendix N**.

Table 11-15 Alternative 4 Improved: Continuous Flow Intersection-Diverging Diamond Interchange-Superstreet (CFI-DDI-SS) – Design Year 2038 AM/PM Arterial Level Of Service VISSIM Summary

Roadway	Direction	Segment	Travel Speed (mph)	Build CFI-DDI-SS LOS ⁽¹⁾
Colonial Boulevard (SR 884)	EB	Ortiz Avenue to Rolfes Road	31.58/34.61	C/B
		Rolfes Road to I-75 SB Ramps	21.29/25.74	D/C
		I-75 SB ramps to I-75 NB Ramps	30.92/26.84	C/C
		I-75 NB Ramps to Forum Boulevard	40.09/37.97	B/B
		Forum Boulevard to Dynasty Drive	43.69/40.90	A/B
Colonial Boulevard (SR 884)	WB	Dynasty Drive to Forum Boulevard	22.55/24.00	D/D
		Forum Boulevard to I-75 NB Ramps	23.78/22.50	D/D
		I-75 NB ramps to I-75 SB Ramps	22.75/22.93	D/D
		I-75 SB ramps to Ortiz Avenue	29.57/32.89	C/C

(1) LOS based on V/C ratio <=1 from Exhibit 17-2 of HCM 2010.

The travel times used to calculate travel speed along Colonial Boulevard were derived from the VISSIM model.

The results of the arterial analysis show that Colonial Boulevard operates at an acceptable level of service D or better with Alternative 4 Improved.

11.1.3.5 Design Year Queue Length Comparison

Queue lengths for each lane group were derived from maximum queues obtained from VISSIM analysis performed. A comparison of queues for No Build and Build scenarios for the design year 2038 for the ramp terminal intersections is presented in **Table 11-16**. The

build scenario considered is Alternative 4 Improved (CFI-DDI-SS). The queue lengths along the ramp at the ramp terminal intersections could impact the mainline and there should be no spillback from the ramps onto the I-75 mainline from safety and operational perspective. The ramp lengths for both northbound and southbound off ramps from I-75 mainline at Colonial Boulevard and at SR 82 ranges from approximately 1,450 feet to 2,000 feet.

Table 11-16 Alternative 4 Improved: Continuous Flow Intersection-Diverging Diamond Interchange-Superstreet (CFI-DDI-SS) – Design Year 2038 AM/PM Queue Length Calculations

Intersections	Existing Storage Length (feet per lane)	2038 No-Build Queue (feet per lane)	2038 Build Alt 4 Improved – CFI-DDI-SS Scenario Queue (feet per lane)
Colonial Boulevard @ I-75 Southbound Ramps			
Southbound Left	930	320/338	269/246
Southbound Right	930	13266/13265	548/340
Colonial Boulevard @ I-75 Northbound Ramps			
Northbound Left	1450	603/5485	316/451
Northbound Right	1450	331/390	232/386
SR 82 @ I-75 Southbound Ramps			
Southbound Left	525	5093/5105	553/470
Southbound Right	525	210/168	559/488
SR 82 @ I-75 Northbound Ramps			
Northbound Left	475	13695/13701	556/609
Northbound Right	475	13705/13709	231/596

Also, the design year 2038 storage length calculations for the preferred build Alternative 4 Improved based on Plans Preparation Manual Volume 1 (Revised – July 1, 2013) for the signalized intersections and Florida Green Book May 2011 for the un-signalized intersections (Colonial Boulevard at Colonial Center Drive and Dynasty Drive) have been included in **Appendix N**. The recommended turn lane lengths have been rounded to the nearest 25 feet increment and are shown in **Table 11-17**. Queues will not exceed available storage under the build condition and will not impact the mainline.

Table 11-17 Alternative 4 Improved: Continuous Flow Intersection-Diverging Diamond Interchange-Superstreet (CFI-DDI-SS) – Design Year (2038) – Build Recommended Turn Lane Lengths

Colonial Boulevard Intersections	Approach	Movement	Recommended Turn Lane Length (feet)
Ortiz Avenue	Eastbound	Left	1075*
		Right	700*
	Westbound	Left	1175*
		Right	1075*
	Northbound	Left	450
		Right	1450
	Southbound	Left	700
		Right	1100
Colonial Center Drive** (un-signalized)	Westbound	Right	475
	Southbound	Right	200
Rolfes Road	Eastbound	Right	900*
	Northbound	Right	700
I-75 SB Ramps	Eastbound	Right	2500*
	Westbound	Left	1525*
	Southbound	Left	750
		Right	975
I-75 NB Ramps	Eastbound	Left	1375*
	Westbound	Right	1325*
	Northbound	Left	850
		Right	750
Forum Boulevard	Eastbound	Left	750*
		Right	450
	Westbound	Left	325
		Right	1300*
	Northbound	Left	325
		Right	300
	Southbound	Left	700
		Right	700
Dynasty Drive** (un-signalized)	Westbound	Right	350
	Southbound	Right	75

* Actual distances to be accommodated are shown in the Conceptual Plans included in Appendix U.

** For un-signalized intersections, turn lane lengths estimated from *Florida Greenbook, May 2011*.

Signalized intersections based on *Plans Preparation Manual revised July 1, 2013*.

11.2 OPENING YEAR (2018) ANALYSIS

11.2.1 Opening Year Physical Conditions

An analysis of the opening year (2018) was conducted for the No-Build Alternative and the preferred build alternative that was recommended for the design year 2038 – Alternative 4 Improved.

The geometry for the No-Build (Existing) and the Preferred Build Alternative 4 Improved are shown previously in **Figures 4-3** and **11-5**, respectively.

11.2.2 Opening Year Traffic Volumes

Opening year (2018) traffic volumes for the roadways and intersections for the No-Build and the Build alternatives were obtained as explained in **Section 10.1** of this report and is shown in **Figure 10-2**.

11.2.3 Opening Year No-Build Operational Analysis

11.2.3.1 Opening Year No-Build Freeway and Ramp Merge/Diverge Analysis

I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010 for the No-Build scenario. The results of the HCS analyses are summarized in **Table 11-18**. All the no-build condition HCS (freeway and ramp junction) analyses output worksheets are contained in **Appendix O**.

Table 11-18 Opening Year (2018) No-Build AM/PM HCS Freeway and Ramp Merge/Diverge Area Summary

Location	I-75 Freeway			I-75 Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
NB Freeway Segment S. of Colonial Boulevard	3057/4053	15.9/21.3	B/C			
NB Off-Ramp to Colonial Boulevard	3057/4053			719/1069	23.2/29.1	C/D
NB On-Loop Ramp from eastbound Colonial Boulevard	2338/2984			638/913	16.0/21.5	B/C
NB On-Ramp from westbound Colonial Boulevard	2976/3897			181/129	19.8/24.0	B/C
NB Freeway Segment N. of Colonial Boulevard	3157/4026	16.4/21.1	B/C			
NB Off-Ramp to SR 82	3157/4026			509/658	23.3/28.1	C/D
NB On-Ramp from SR 82	2648/3368			699/547	22.3/24.7	C/C
NB Freeway Segment N. of SR 82	3347/3915	17.4/20.5	B/C			
SB Freeway Segment N. of SR 82	3976/2999	20.8/15.6	C/B			
SB Off-Ramp to SR 82	3976/2999			744/588	28.0/22.6	D/C
SB On-Ramp from SR 82	3232/2411			528/725	24.4/21.9	C/C
SB Freeway Segment N. of Colonial Boulevard	3760/3136	19.6/16.3	C/B			
SB Off-Ramp to Colonial Boulevard	3760/3136			1174/839	27.9/23.9	C/C
SB On-Ramp from Colonial Boulevard	2586/2297			865/1080	23.3/23.6	C/C
SB Freeway Segment S. of Colonial Boulevard	3451/3377	17.9/17.5	B/B			

Based on the results of the analysis, all the mainline freeway segments and the ramp merge/diverge junctions within the study area operate within the acceptable level of service.

11.2.3.2 Opening Year No-Build Ramp Terminal and Cross-Street Intersection Analysis

The ramp terminal intersections and cross-street intersections on Colonial Boulevard at Ortiz Avenue, I-75 southbound ramps, I-75 northbound off-ramp, Forum Boulevard and Dynasty Drive and along SR 82 at the southbound and northbound ramp intersections were analyzed for the opening year AM and PM peak No-Build condition using VISSIM. The results of the analysis for the signalized and un-signalized intersections for the No Build scenario are summarized in **Table 11-19**. The output from VISSIM analyses are contained in **Appendix O**.

Table 11-19 Opening Year (2018) No-Build AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	54.8/>80.0 ⁽¹⁾
Colonial Boulevard at Colonial Center Drive	Un-signalized	>80.0/30.2 ⁽¹⁾
Colonial Boulevard at Rolfes Road	Un-signalized	8.3/19.2
Colonial Boulevard at I-75 SB Ramps	Signalized	42.5/25.9
Colonial Boulevard at I-75 NB Ramps	Signalized	46.1/19.4
Colonial Boulevard at Forum Boulevard	Signalized	72.6/28.5
Colonial Boulevard at Dynasty Drive	Un-signalized	61.6/0.5
SR 82 @ I-75 SB Ramps	Signalized	20.4/21.0
SR 82 @ I-75 NB Ramps	Signalized	18.3/24.6

(1) Excessive delay values.

The results from the intersection analysis show that with the exception of the intersection of Colonial Boulevard at Ortiz Avenue, Colonial Center Drive, Forum Boulevard and Dynasty Drive, all other study intersections operate within an acceptable delay. Some of the minor approaches do operate with higher delays (also, at the un-signalized locations).

11.2.4 Opening Year Build Operational Analysis

11.2.4.1 Opening Year Build Freeway and Ramp Merge/Diverge Analysis

I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010 for the Build scenario. Along I-75 an additional auxiliary lane was added as planned in each direction between Colonial Boulevard and SR 82. This is a part of the approved I-75 Ultimate (PD&E) Concept as identified in the I-75 PD&E Study dated November 2002, System Interchange Modification Report (SIMR) approved on 8/8/2008 and in the Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. The results of the HCS analyses are summarized in **Table 11-20**. All the build condition HCS (freeway and ramp junction) analyses output worksheets are contained in **Appendix P**.

Table 11-20 Opening Year (2018) Build AM/PM HCS Freeway and Ramp Merge/Diverge Area Summary

Location	I-75 Freeway			I-75 Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
NB Freeway Segment S. of Colonial Boulevard	3057/4053	15.9/21.3	B/C			
NB Off-Ramp to Colonial Boulevard	3057/4053			719/1069	11.5/17.4	B/B
NB Freeway Segment N. of Colonial Boulevard	3157/4026	14.9/19.9	B/B			
NB On-Ramp from SR 82	2648/3368			699/547	15.5/18.1	B/B
NB Freeway Segment N. of SR 82	3347/3915	13.0/15.2	B/B			
SB Freeway Segment N. of SR 82	3976/2999	15.5/11.7	B/B			
SB Off-Ramp to SR 82	3976/2999			744/588	16.3/10.9	B/B
SB Freeway Segment N. of Colonial Boulevard	3760/3136	18.4/14.9	B/B			
SB On-Ramp from Colonial Boulevard	2586/2297			865/1080	16.5/16.7	B/B
SB Freeway Segment S. of Colonial Boulevard	3451/3377	17.9/17.5	B/B			

Based on the results of the analysis, all the mainline freeway segments and the ramp merge/diverge junctions within the study area operate within the acceptable level of service. Although I-75 NB Off Ramp to SR 82 operates at an acceptable level of service as a single lane diverge, when the auxiliary lane is built, it needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

11.2.4.2 Opening Year Build Ramp Terminal and Cross-Street Intersection Analysis

The ramp terminal intersections and cross-street intersections on Colonial Boulevard at Ortiz Avenue, I-75 southbound ramps, I-75 northbound ramps, Forum Boulevard and Dynasty Drive and along SR 82 at the southbound and northbound ramp intersections were analyzed for the opening year AM and PM peak Build condition using VISSIM. The opening year build analysis was performed for the Alternative 4 Improved (CFI-DDI-SS) configuration for the design year 2038. The results of the analysis for the signalized and un-signalized intersections are summarized in **Table 11-21**. The output from VISSIM analyses are contained in **Appendix P**.

Table 11-21 Opening Year (2018) Build Scenario AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	27.3/29.9
Colonial Boulevard at Colonial Center Drive	Un-signalized	1.3/0.7
Colonial Boulevard at Rolfes Road	Signalized	8.4/5.7
Colonial Boulevard at I-75 SB Ramps	Signalized	16.4/16.4
Colonial Boulevard at I-75 NB Ramps	Signalized	14.1/17.7
Colonial Boulevard at Forum Boulevard	Signalized	16.7/15.3
Colonial Boulevard at Dynasty Drive	Un-signalized	1.9/0.9
SR 82 @ I-75 SB Ramps	Signalized	19.2/20.4
SR 82 @ I-75 NB Ramps	Signalized	17.9/23.5

The results from the intersection analysis for the Build scenario show that all the study intersections operate within an acceptable delay.

11.2.4.3 Opening Year Arterial Level of Service for Colonial Boulevard

Arterial analysis was performed to determine the performance of Colonial Boulevard from Ortiz Avenue to Dynasty Drive in a coordinated signalized intersection system under the Alternative 4 Improved (CFI-DDI-SS) configuration. The arterial level of service was calculated based on the travel time results obtained from VISSIM analysis using the Exhibit 17-2 of Highway Capacity Manual (HCM) 2010. The arterial level of service has only been computed for the build condition for which volume to capacity ratio is less than or equal to 1.0. The arterial level of service was not computed for the no-build condition as for volume to capacity greater than 1.0 condition, arterial level of service is automatically F. The traffic that is backed up at the Ortiz Avenue and I-75, does not enter the network in the no-build condition, thus the arterial level of service for Colonial Boulevard for the no-build condition might appear to be better than the build level of service.

The arterial level of service for Colonial Boulevard for the Build scenario is shown in **Table 11-22**. The travel time results and the arterial level of service calculations are also included in **Appendix P**.

Table 11-22 Opening Year 2018 AM/PM Arterial Level of Service VISSIM Summary

Roadway	Direction	Segment	Travel Speed (mph)	Build CFI-DDI-SS LOS ⁽¹⁾
Colonial Boulevard (SR 884)	EB	Ortiz Avenue to Rolfes Road	37.91/35.81	B/B
		Rolfes Road to I-75 SB Ramps	23.09/23.47	D/D
		I-75 SB ramps to I-75 NB Ramps	25.54/26.43	C/C
		I-75 NB Ramps to Forum Boulevard	37.49/38.48	B/B
		Forum Boulevard to Dynasty Drive	43.93/43.81	A/A
Colonial Boulevard (SR 884)	WB	Dynasty Drive to Forum Boulevard	22.54/23.99	D/D
		Forum Boulevard to I-75 NB Ramps	31.26/25.01	C/C
		I-75 NB ramps to I-75 SB Ramps	29.07/23.94	C/D
		I-75 SB ramps to Ortiz Avenue	36.84/38.23	B/B

(1) LOS based on V/C ratio <=1 from Exhibit 17-2 of HCM 2010.

The travel times used to calculate travel speed along Colonial Boulevard were derived from the VISSIM model.

The results of the arterial analysis show that Colonial Boulevard operates at an acceptable level of service D or better during the opening year under the Build scenario.

11.2.4.4 Opening Year Queue Length Comparison

Queue lengths for each lane group were derived from maximum queues obtained from VISSIM analysis performed. A comparison of queues for No Build and Build scenarios for the ramp terminal intersections is presented in **Table 11-23**. The queue lengths along the ramp at the ramp terminal intersections could impact the mainline and there should be no spillback from the ramps onto the I-75 mainline from safety and operational perspective. The ramp lengths for both northbound and southbound off ramps from I-75 mainline at Colonial Boulevard and at SR 82 ranges from approximately 1,450 feet to 2,000 feet.

Table 11-23 Opening Year 2018 AM/PM Queue Length Calculations

Intersections	Existing Storage Length (feet per lane)	2018 No-Build Queue (feet per lane)	2018 Build Alt 4 Improved – CFI-DDI-SS Scenario Queue (feet per lane)
Colonial Boulevard @ I-75 Southbound Ramps			
Southbound Left	930	124/152	126/121
Southbound Right	930	4937/8258	509/300
Colonial Boulevard @ I-75 Northbound Ramps			
Northbound Left	1450	1024/5486	316/335
Northbound Right	1450	134/164	166/191
SR 82 @ I-75 Southbound Ramps			
Southbound Left	525	380/388	392/361
Southbound Right	525	272/231	409/374
SR 82 @ I-75 Northbound Ramps			
Northbound Left	475	304/460	225/398
Northbound Right	475	241/362	129/146

Queues will not exceed available storage under the build condition and will not impact the mainline.

11.3 INTERIM YEAR (2028) ANALYSIS

11.3.1 Interim Year 2028 Physical Conditions

An analysis of the interim year (2028) was conducted for the No-Build Alternative and the Preferred Build Alternative that was recommended for the design year 2038 – Alternative 4 Improved.

The geometry for the No-Build and the Preferred Build Alternative 4 Improved are shown in **Figures 4-4** and **11-5**, respectively.

11.3.2 Interim Year 2028 Traffic Volumes

Interim year (2028) traffic volumes for the roadways and intersections for the No-Build and the Build alternatives were obtained as explained in **Section 10.1** of this report and is shown in **Figure 10-3**.

11.3.3 Interim Year No-Build Operational Analysis

11.3.3.1 Interim Year No-Build Freeway and Ramp Merge/Diverge Analysis

I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010 for the No-Build scenario. The results of the HCS analyses are summarized in **Table 11-24**. All the no-build condition HCS (freeway and ramp junction) analyses output worksheets are contained in **Appendix Q**.

Table 11-24 Interim Year (2028) No-Build AM/PM HCS Freeway and Ramp Merge/Diverge Area Summary

Location	I-75 Freeway			I-75 Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
NB Freeway Segment S. of Colonial Boulevard	4334/5746	21.7/31.5	C/D			
NB Off-Ramp to Colonial Boulevard	4334/5746			886/1312	23.0/31.0	C/D
NB On-Loop Ramp from eastbound Colonial Boulevard	3448/4434			701/998	22.7/30.9	C/D
NB On-Ramp from westbound Colonial Boulevard	4149/5432			345/247	25.1/32.9	C/D
NB Freeway Segment N. of Colonial Boulevard	4494/5679	22.6/31.0	C/D			
NB Off-Ramp to SR 82	4494/5679			852/1097	23.8/30.4	C/D
NB On-Ramp from SR 82	3642/4582			980/742	25.8/30.3	C/D
NB Freeway Segment N. of SR 82	4622/5324	23.4/28.2	C/D			
SB Freeway Segment N. of SR 82	5335/4025	28.2/20.0	D/C			
SB Off-Ramp to SR 82	5335/4025			875/817	28.3/21.3	D/C
SB On-Ramp from SR 82	4460/3208			901/947	30.5/22.7	D/C
SB Freeway Segment N. of Colonial Boulevard	5361/4155	28.4/20.7	D/C			
SB Off-Ramp to Colonial Boulevard	5361/4155			1446/1032	29.2/22.4	D/C
SB On-Ramp from Colonial Boulevard	3915/3123			1109/1282	28.0/24.1	C/C
SB Freeway Segment S. of Colonial Boulevard	5024/4405	26.0/22.1	C/C			

Based on the results of the analysis, all the mainline freeway segments and the ramp merge/diverge junctions within the study area operate within the acceptable level of service.

11.3.3.2 Interim Year No-Build Ramp Terminal and Cross-Street Intersection Analysis

The ramp terminal intersections and cross-street intersections on Colonial Boulevard at Ortiz Avenue, I-75 southbound ramps, I-75 northbound off-ramp, Forum Boulevard and Dynasty Drive and along SR 82 at the southbound and northbound ramp intersections were analyzed for the opening year AM and PM peak No-Build condition using VISSIM. The results of the analysis for the signalized and un-signalized intersections for the No Build scenario are summarized in **Table 11-25**. The output from VISSIM analyses are contained in **Appendix Q**.

Table 11-25 Interim Year (2028) No-Build AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	>80.0/>80.0 ⁽¹⁾
Colonial Boulevard at Colonial Center Drive	Un-signalized	4.8/3.6
Colonial Boulevard at Rolfes Road	Un-signalized	16.5/22.3
Colonial Boulevard at I-75 SB Ramps	Signalized	40.7/49.6
Colonial Boulevard at I-75 NB Ramps	Signalized	16.3/36.4
Colonial Boulevard at Forum Boulevard	Signalized	36.4/32.9
Colonial Boulevard at Dynasty Drive	Un-signalized	5.4/0.1
SR 82 @ I-75 SB Ramps	Signalized	26.0/29.7
SR 82 @ I-75 NB Ramps	Signalized	23.0/35.5

(1) Excessive delay values.

The results from the intersection analysis show that with the exception of the intersection of Colonial Boulevard at Ortiz Avenue, all other study intersections operate within an acceptable delay. Some of the minor approaches do with higher delays (also, at the un-signalized locations).

11.3.4 Interim Year Build Operational Analysis

11.3.4.1 Interim Year Build Freeway and Ramp Merge/Diverge Analysis

I-75 mainline freeway segments and the ramp merge/diverge areas were analyzed using HCS 2010 for the Build scenario. Along I-75 an additional auxiliary lane as planned was added in each direction between Colonial Boulevard and SR 82. This is a part of the approved I-75 Ultimate (PD&E) Concept as identified in the I-75 PD&E Study dated November 2002, System Interchange Modification Report (SIMR) approved on 8/8/2008 and in the Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. The results of the HCS analyses are summarized in **Table 11-26**. All the build condition HCS (freeway and ramp junction) analyses output worksheets are contained in **Appendix R**.

Table 11-26 Interim Year (2028) Build AM/PM HCS Freeway and Ramp Merge/Diverge Area Summary

Location	I-75 Freeway			I-75 Merge/Diverge Area		
	Freeway Volume (veh/hr)	Density (pc/mi/ln)	LOS	Ramp Volume (veh/hr)	Density (pc/mi/ln)	LOS
NB Freeway Segment S. of Colonial Boulevard	4334/5746	21.7/31.5	C/D			
NB Off-Ramp to Colonial Boulevard	4334/5746			886/1312	23.0/31.0	C/D
NB On-Ramp from westbound Colonial Boulevard	3448/4434			1046/1245	24.2/32.3	C/D
NB Freeway Segment N. of Colonial Boulevard	4494/5679	16.7/21.3	B/C			
NB Off-Ramp to SR 82	4494/5679			852/1097	24.0/30.6	C/D
NB On-Ramp from SR 82	3642/4582			980/742	25.8/30.3	C/D
NB Freeway Segment N. of SR 82	4622/5324	23.4/28.2	C/D			
SB Freeway Segment N. of SR 82	5335/4025	28.2/20.0	D/C			
SB Off-Ramp to SR 82	5335/4025			875/817	28.3/21.3	D/C
SB On-Ramp from SR 82	4460/3208			901/947	29.8/22.2	D/C
SB Freeway Segment N. of Colonial Boulevard	5361/4155	20.0/15.4	C/B			
SB Off-Ramp to Colonial Boulevard	5361/4155			1446/1032	29.2/22.4	D/C
SB On-Ramp from Colonial Boulevard	3915/3123			1109/1282	28.0/24.1	C/C
SB Freeway Segment S. of Colonial Boulevard	5024/4405	26.0/22.1	C/C			

Based on the results of the analysis, all the mainline freeway segments and the ramp merge/diverge junctions within the study area operate within the acceptable level of service. Although I-75 NB Off Ramp to SR 82 operates at an acceptable level of service as a single lane diverge, when the auxiliary lane is built, it needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

11.3.4.2 Interim Year Build Ramp Terminal and Cross-Street Intersection Analysis

The ramp terminal intersections and cross-street intersections on Colonial Boulevard at Ortiz Avenue, I-75 southbound ramps, I-75 northbound ramps, Forum Boulevard and Dynasty Drive and along SR 82 at the southbound and northbound ramp intersections were analyzed for the interim year AM and PM peak Build condition using VISSIM. The interim year build analysis was performed for the Alternative 4 Improved (CFI-DDI-SS) configuration for the design year 2038. The results of the analysis for the signalized and un-signalized intersections for the Build scenario are summarized in **Table 11-27**. The output from VISSIM analyses are contained in **Appendix R**.

Table 11-27 Interim Year (2028) Build Scenario AM/PM Intersection Analysis – VISSIM Summary

Intersection	Control Type	Overall Average Delay (sec/veh)
Colonial Boulevard at Ortiz Avenue	Signalized	34.0/33.3
Colonial Boulevard at Colonial Center Drive	Un-signalized	0.2/0.3
Colonial Boulevard at Rolfes Road	Signalized	7.1/6.8
Colonial Boulevard at I-75 SB Ramps	Signalized	16.6/14.7
Colonial Boulevard at I-75 NB Ramps	Signalized	19.4/16.6
Colonial Boulevard at Forum Boulevard	Signalized	17.1/16.5
Colonial Boulevard at Dynasty Drive	Un-signalized	1.5/0.1
SR 82 @ I-75 SB Ramps	Signalized	20.2/24.6
SR 82 @ I-75 NB Ramps	Signalized	20.8/27.6

The results from the intersection analysis for the Build scenario show that all the study intersections operate within an acceptable delay under the Build condition.

11.3.4.3 Interim Year Arterial Level of Service for Colonial Boulevard

Arterial analysis was performed to determine the performance of Colonial Boulevard from Ortiz Avenue to Dynasty Drive in a coordinated signalized intersection system under the Alternative 4 Improved (CFI-DDI-SS) configuration. The arterial level of service was calculated based on the travel time results obtained from VISSIM analysis using the Exhibit 17-2 of Highway Capacity Manual (HCM) 2010. The arterial level of service has only been computed for the build condition for which volume to capacity ratio is less than or equal to 1.0. The arterial level of service was not computed for the no-build condition as for volume to capacity greater than 1.0 condition, arterial level of service is automatically F. The traffic that is backed up at the Ortiz Avenue and I-75, does not enter the network in the no-build condition, thus the arterial level of service for Colonial Boulevard for the no-build condition might appear to be better than the build level of service.

The arterial level of service for Colonial Boulevard for the preferred build alternative is shown in **Table 11-28** below. The travel time results and the arterial level of service calculations are also included in **Appendix R**.

Table 11-28 Interim Year 2028 AM/PM Arterial Level Of Service VISSIM Summary

Roadway	Direction	Segment	Travel Speed (mph)	Build CFI-DDI-SS LOS ⁽¹⁾
Colonial Boulevard (SR 884)	EB	Ortiz Avenue to Rolfes Road	39.48/37.35	B/B
		Rolfes Road to I-75 SB Ramps	20.03/24.00	D/D
		I-75 SB Ramps to I-75 NB Ramps	42.82/37.65	A/B
		I-75 NB Ramps to Forum Boulevard	35.61/38.03	B/B
		Forum Boulevard to Dynasty Drive	42.81/43.10	A/A
Colonial Boulevard (SR 884)	WB	Dynasty Drive to Forum Boulevard	23.64/24.65	D/D
		Forum Boulevard to I-75 NB Ramps	24.29/23.77	D/D
		I-75 NB Ramps to I-75 SB Ramps	36.17/33.52	B/B
		I-75 SB Ramps to Ortiz Avenue	40.50/36.09	B/B

(1) LOS based on V/C ratio ≤ 1 from Exhibit 17-2 of HCM 2010.

The travel times used to calculate travel speed along Colonial Boulevard were derived from the VISSIM model.

The results of the arterial analysis show that Colonial Boulevard operates at an acceptable level of service D or better during the interim year with Alternative 4 Improved.

11.3.4.4 Interim Year Queue Length Comparison

Queue lengths for each lane group were derived from maximum queues obtained from VISSIM analysis performed. A comparison of queues for No Build and Build scenarios for interim year 2028 for the ramp terminal intersections is presented in **Table 11-29**. The queue lengths along the ramp at the ramp terminal intersections could impact the mainline and there should be no spillback from the ramps onto the I-75 mainline from safety and operational perspective. The ramp lengths for both northbound and southbound off ramps from I-75 mainline at Colonial Boulevard and at SR 82 ranges from approximately 1,450 feet to 2,000 feet.

Table 11-29 Interim Year 2028 AM/PM Queue Length Calculations

Intersections	Existing Storage Length (feet per lane)	2028 No-Build Queue (feet per lane)	2028 Build Alt 4 Improved – CFI-DDI-SS Scenario Queue (feet per lane)
Colonial Boulevard @ I-75 Southbound Ramps			
Southbound Left	930	305/294	163/183
Southbound Right	930	1674/1674	486/348
Colonial Boulevard @ I-75 Northbound Ramps			
Northbound Left	1450	561/1662	228/296
Northbound Right	1450	295/246	118/205
SR 82 @ I-75 Southbound Ramps			
Southbound Left	525	518/1118	377/370
Southbound Right	525	204/189	395/390
SR 82 @ I-75 Northbound Ramps			
Northbound Left	475	853/1674	353/624
Northbound Right	475	865/1674	157/182

Queues will not exceed available storage under the build condition and will not impact the mainline.

SECTION 12 IMPROVEMENT COSTS AND FUNDING COMMITMENTS

The cost estimates for the Tight Urban Diamond Interchange (TUDI) alternative and the preferred alternative, Alternative 4 Improved - Diverging Diamond Interchange (DDI) with Continuous Flow Intersection (CFI) at Ortiz Avenue and Superstreet Intersection (SS) are shown in **Table 12-1** and **Table 12-2**. These estimates are also included in **Appendix S**.

These estimates are provided for comparative purposes in evaluating alternatives only. The Right-Of-Way costs were not needed for the TUDI alternative but it was included for the CFI-DDI-SS alternative. The cost estimate for the TUDI alternative is \$ 15.0 million and the cost estimate for the CFI-DDI-SS is \$ 17.6 million.

Table 12-1 Draft Cost Estimate for Alternative 3: Tight Urban Diamond Interchange (TUDI)

TUDI Alternative 3 Draft Cost Estimate					
Roadway Pay Items					
Pay Item	Description	Quantity	Unit	Unit Price	Total
101-1	Mobilization (10%)	1	LS	\$1,190,814.01	\$1,190,814.01
102-1	Maintenance of Traffic (10%)	1	LS	\$1,190,814.01	\$1,190,814.01
104-10-3	Sediment Barrier	30,768	LF	\$0.38	\$11,691.84
104-11	Floating Turbidity Barrier	1,120	LF	\$4.80	\$5,376.00
104-12	Staked Turbidity Barrier	1,120	LF	\$2.45	\$2,744.00
104-15	Soil Tracking Prevention Device	5	EA	\$1,295.81	\$6,479.05
107-1	Litter Removal	8.24	AC	\$34.91	\$287.66
107-2	Mowing	8.24	AC	\$34.91	\$287.66
110-1-1	Clearing and Grubbing	49.81	AC	\$2,401.34	\$119,610.75
120-6	Embankment	248,760	CY	\$5.24	\$1,303,502.40
160-4	Stabilization, Type B	200,845	SY	\$3.59	\$721,034.27
285-711	Optional Base, Base Group 11	191,276	SY	\$13.16	\$2,517,186.90
334-1-23	SuperPave Asphalt Concrete (Traffic C) (4") (PG 76-22) (PMA)	41,821.8	TN	\$88.67	\$3,708,339.01
337-7-43	Asphaltic Concrete Friction Course (Traffic C) (PG 76-22) (PMA)	14,690.6	TN	\$97.90	\$1,438,209.74
520-1-10	Concrete Curb & Gutter, Type F	33,009	LF	\$17.50	\$577,652.95
520-5-21	Concrete Traffic Separator, Type II, 4' Wide	1,507	LF	\$24.53	\$36,969.41
522-1	Sidewalk Concrete 4"	9,654	SY	\$29.73	\$287,004.50
570-1-1	Performance Turf	36,013	SY	\$0.73	\$26,289.24
700-3-225	SIGN PANEL, F&I, OVERHEAD MOUNT	6	EA	\$350.00	\$2,100.00
700-3-304	SIGN PANEL, F&I, BRIDGE MOUNT	2	EA	\$3,167.62	\$6,335.24
700-4-113	Overhead Static Sign Structure, F&I, Cantilever, 31-40FT	4	AS	\$73,571.37	\$294,285.48
700-4-126	Overhead Static Sign Structure, F&I, Span 101-150FT	2	AS	\$181,186.10	\$362,372.20
	TOTAL				\$13,809,386.29
Signing and Pavement Marking Pay Items					
706-3	Total RPMs	3,319	EA	\$3.31	\$10,986.53
	10-30 Skip @ 40' CC	1,202			
	Intersection , Ramps, Gores @ 20' CC	2,117			
710-11-111	Painted Pavement Markings, White, Solid, 6"	14,577	NM	\$844.89	\$12,316.18
710-11-123	Painted Pavement Markings, White, Solid, 12"	2,819	LF	\$0.58	\$1,634.92
710-11-125	Painted Pavement Markings, White, Solid, 24"	3,554	LF	\$1.12	\$3,980.59
710-11-131	Painted Pavement Markings, White, Skip, 6", 10-30, 3-9	9,418	GM	\$345.80	\$3,256.92
	Painted Pavement Markings, White, 10-30 Skip, 6"	9,109			
	Painted Pavement Markings, White, 3-9 Skip, 6"	0,309			
710-11-151	Painted Pavement Markings, White, dotted, 6", 6-10	6,551	LF	\$0.25	\$1,637.76
	Painted Pavement Markings, White, 2-4 Skip, 6"	6,139			
	Painted Pavement Markings, White, 6-10 Skip, 6"	412			
710-11-160	Pavement Message "ONLY" "MERGE" "RAMP"	60	EA	\$36.10	\$2,166.00
710-11-170	Directional Arrows	324	EA	\$21.56	\$6,985.44
710-11-211	Painted Pavement Markings, Yellow, Solid, 6"	5,013	NM	\$846.54	\$4,244.05
710-11-231	Painted Pavement Markings, Yellow, 6-10 Skip, 6"	0.033	GM	\$130.17	\$4.24
	TOTAL				\$47,212.63
Signalization Pay Items					
630-2-11	Conduit, F&I, Open Trench	3,150	LF	\$5.42	\$17,073.00
630-2-12	Conduit, F&I, Directional Bore	1,350	LF	\$15.23	\$20,560.50
632-7-1	Signal Cable - New or Reconstructed Intersection, F&I	5	PI	\$3,492.77	\$17,463.85
635-2-11	Pull & Splice Box, F&I, 13"x24"	99	EA	\$448.39	\$44,390.61
639-1-112	Electrical Power Service, F&I, OH. Meter Purchased by Contractor	5	AS	\$2,102.12	\$10,510.60
639-2-1	Electrical Service Wire	300	LF	\$2.52	\$756.00
641-2-11	Prestressed Conc. Pole, F&I, Type P-II, Pedestal	5	EA	\$833.24	\$4,166.20
649-1-10	Steel Strain Pole, F&I, Pedestal	5	EA	\$700.00	\$3,500.00
649-31-105	Mast Arm, F&I, Wind Speed-150, Single Arm, w/o Luminaire-78	18	EA	\$37,248.55	\$670,473.90
650-1-311	Traffic Signal, F&I, 3 Section, 1 Way, Aluminum	75	AS	\$1,000.24	\$75,018.00
653-191	Pedestrian Signal, F&I, LED-Countdown, 1 Direction	46	AS	\$669.55	\$30,799.30
660-1-102	Loop Detector Inductive, F&I, Type 2	75	EA	\$165.00	\$12,375.00
660-2-106	Loop Assembly, F&I, Type F	75	AS	\$650.71	\$48,803.25
665-1-11	Pedestrian Detector, F&I, Standard	46	EA	\$173.65	\$7,987.90
670-5-111	Traffic Controller Assembly, F&I, NEMA, 1 Preemption	5	AS	\$23,771.30	\$118,856.50
700-5-22	Internally Illuminated Sign, F&I, OM, 12-18 SF	18	EA	\$3,485.56	\$62,740.08
	TOTAL				\$1,145,474.69

Grand Total \$15,002,073.61

Table 12-2 Draft Cost Estimate for Alternative 4 Improved: Continuous Flow Intersection-Diverging Diamond Interchange-Superstreet (CFI-DDI-SS)

DDI Alternative 4 Improved with CFI-SS Draft Cost Estimate					
Roadway Pay Items					
Pay Item	Description	Quantity	Unit	Unit Price	Total
101-1	Mobilization (10%)	1	LS	\$1,452,020.99	\$1,452,020.99
102-1	Maintenance of Traffic (10%)	1	LS	\$1,452,020.99	\$1,452,020.99
104-10-3	Sediment Barrier	30,768	LF	\$0.38	\$11,691.84
104-11	Floating Turbidity Barrier	1,120	LF	\$4.80	\$5,376.00
104-12	Staked Turbidity Barrier	1,120	LF	\$2.45	\$2,744.00
104-15	Soil Tracking Prevention Device	5	EA	\$1,295.81	\$6,479.05
107-1	Litter Removal	8.24	AC	\$34.91	\$287.66
107-2	Mowing	8.24	AC	\$34.91	\$287.66
110-1-1	Clearing and Grubbing	55.52	AC	\$2,401.34	\$133,322.40
120-6	Embankment	248,760	CY	\$5.24	\$1,303,502.40
160-4	Stabilization, Type B	207,932	SY	\$3.59	\$746,475.88
285-711	Optional Base, Base Group 11	197,054	SY	\$13.16	\$2,593,230.64
334-1-23	SuperPave Asphalt Concrete (Traffic C) (4") (PG 76-22) (PMA)	42,810.0	TN	\$88.67	\$3,795,962.70
337-7-43	Asphaltic Concrete Friction Course (Traffic C) (PG 76-22) (PMA)	15,056.7	TN	\$97.90	\$1,474,050.93
520-1-10	Concrete Curb & Gutter, Type F	39,764	LF	\$17.50	\$695,870.00
520-5-21	Concrete Traffic Separator, Type II, 4' Wide	2,784	LF	\$24.53	\$68,291.52
522-1	Sidewalk Concrete 4"	9,704	SY	\$29.73	\$288,488.03
570-1-1	Performance Turf	56,542	SY	\$0.73	\$41,275.37
700-3-225	SIGN PANEL, F&I, OVERHEAD MOUNT	8	EA	\$350.00	\$2,800.00
700-3-304	SIGN PANEL, F&I, BRIDGE MOUNT	4	EA	\$3,167.62	\$12,670.48
700-4-113	Overhead Static Sign Structure, F&I, Cantilever, 31-40FT	2	AS	\$73,571.37	\$147,142.74
700-4-126	Overhead Static Sign Structure, F&I, Span 101-150FT	6	AS	\$181,186.10	\$1,087,116.60
	TOTAL				\$15,321,107.87
Signing and Pavement Marking Pay Items					
706-3	Retro-Reflective Pavement Marker	3,173	EA	\$3.31	\$10,501.25
	10-30 Skip @ 40' CC	1,398			
	Intersection, Ramps, gores @ 20' CC	1,775			
710-11-111	Painted Pavement Markings, White, Solid, 6"	13,073	NM	\$844.89	\$11,045.28
710-11-122	Painted Pavement Markings, White, Solid, 8"	4,944	LF	\$0.29	\$1,433.90
710-11-123	Painted Pavement Markings, White, Solid, 12"	3,152	LF	\$0.58	\$1,828.02
710-11-124	Painted Pavement Markings, White, Solid, 18"	5,450	LF	\$0.83	\$4,523.24
710-11-125	Painted Pavement Markings, White, Solid, 24"	3,856	LF	\$1.12	\$4,318.59
710-11-131	Painted Pavement Markings, White, 10-30 Skip, 6"	10,589	GM	\$342.80	\$3,630.04
710-11-151	Painted Pavement Markings, White, 2-4 Skip, 6"	14,735	LF	\$0.25	\$3,683.75
710-11-160	Pavement Message "ONLY"	36	EA	\$36.10	\$1,299.60
710-11-170	Directional Arrows	255	EA	\$21.56	\$5,497.80
710-11-211	Painted Pavement Markings, Yellow, Solid, 6"	5,409	NM	\$846.54	\$4,579.13
710-11-222	Painted Pavement Markings, Yellow, Solid, 8"	85	LF	\$0.30	\$25.56
710-11-224	Painted Pavement Markings, Yellow, Solid, 18"	109	LF	\$0.97	\$105.90
	TOTAL				\$52,472.06
Signalization Pay Items					
630-2-11	Conduit, F&I, Open Trench	4,925	LF	\$5.42	\$26,693.50
630-2-12	Conduit, F&I, Directional Bore	2,075	LF	\$15.23	\$31,602.25
632-7-1	Signal Cable - New or Reconstructed Intersection, F&I	17	PI	\$3,492.77	\$59,377.09
635-2-11	Pull & Splice Box, F&I, 13"x24"	151	EA	\$448.39	\$67,706.89
639-1-112	Electrical Power Service, F&I, OH. Meter Purchased by Contractor	17	AS	\$2,102.12	\$35,736.04
639-2-1	Electrical Service Wire	1,020	LF	\$2.52	\$2,570.40
641-2-11	Prestressed Conc. Pole, F&I, Type P-II, Pedestal	17	EA	\$833.24	\$14,165.08
649-1-10	Steel Strain Pole, F&I, Pedestal	17	EA	\$700.00	\$11,900.00
649-31-105	Mast Arm, F&I, Wind Speed-150, Single Arm, w/o Luminaire-78	30	EA	\$37,248.55	\$1,117,456.50
650-1-311	Traffic Signal, F&I, 3 Section, 1 Way, Aluminum	101	AS	\$1,000.24	\$101,024.24
653-191	Pedestrian Signal, F&I, LED-Countdown, 1 Direction	52	AS	\$669.55	\$34,816.60
660-1-102	Loop Detector Inductive, F&I, Type 2	101	EA	\$165.00	\$16,665.00
660-2-106	Loop Assembly, F&I, Type F	101	AS	\$650.71	\$65,721.71
665-1-11	Pedestrian Detector, F&I, Standard	52	EA	\$173.65	\$9,029.80
670-5-111	Traffic Controller Assembly, F&I, NEMA, 1 Preemption	17	AS	\$23,771.30	\$404,112.10
700-5-22	Internally Illuminated Sign, F&I, OM, 12-18 SF	30	EA	\$3,485.56	\$104,566.80
	TOTAL				\$2,103,144.00
Right of Way					
--	Right of Way Costs (Colonial Blvd at Ortiz Avenue)	1	LS	\$129,269.59	\$129,269.59
	TOTAL				\$129,269.59

Grand Total \$17,605,994

SECTION 13 CONCLUSION

The results of the operational analysis from this IMR and the feasibility of construction make Alternative 4 Improved - Diverging Diamond Interchange (DDI) with Continuous Flow Intersection (CFI) at Ortiz Avenue and Superstreet Intersection (SS) at Forum Boulevard, the most viable and recommended interchange alternative. This alternative has also been selected on the basis of bridge replacement and safety. This alternative will not require replacement of the recently widened I-75 bridges. To effectively improve the operations of adjacent intersections conversion to a Continuous Flow Intersection (CFI) at Ortiz Avenue and Superstreet (SS) intersection at Forum Boulevard are included in this recommended alternative. However, these intersections do not need to be converted to improve operations of the interchange. The DDI configuration in Alternative 4 improves interchange operation along with protection of the mainline. The intersection improvements are corridor improvements and are only for improving traffic operation along Colonial Boulevard arterial away from the interchange. The spacing proposed between the CFI, DDI and SS will be adequate to accommodate vehicle queues eventually protecting the mainline.

Interchange Alternative 4 Improved also satisfies each of the points of the FHWA Policy on Access to the Interstate System. This recommended interchange alternative along with the I-75 approved Ultimate (PD&E) Concept will provide improved traffic operations during the future years. The approved Ultimate (PD&E) Concept along I-75 includes a ten-lane facility comprising of two express lanes in each direction and three GUL in each direction from north of Daniels Parkway to north of SR 82 and auxiliary lanes along local access freeway between Colonial Boulevard and SR 82. This has been identified in I-75 PD&E Study dated November 2002, System Interchange Modification Report (SIMR) approved on 8/8/2008 and also, in Interchange Operational Analysis Report (IOAR) prepared for Lee County and approved by FHWA on 7/20/2009. Although I-75 NB Off Ramp to SR 82 operates at an acceptable level of service as a single lane diverge, when the auxiliary lane is built, it needs to be modified to a two-lane diverge for lane balance purposes per AASHTO standards. The lane balance documentation is included in **Appendix T**. In this context, the I-75 SB Off Ramp to SR 884 would also be a two-lane diverge when the auxiliary lane is built for lane balance purposes.

The opening year interchange improvements were also evaluated as part of this IMR.

The discussion on the screening of build alternatives has been summarized in a comparison matrix (as shown in **Table 13-1**) that compares the different interchange alternatives that have been considered for the design year and also, the result for each alternative with a statement on its feasibility based on operations and constructability has been indicated in the matrix.

The Tight Urban Diamond Interchange (TUDI) Alternative is a feasible alternative but in the long term, the Diverging Diamond Interchange (DDI) provides a more flexible alternative for the left-turn capacity to be increased for traffic entering the on-ramps by developing a shared lane in either direction without replacing the existing bridge structure. This is not possible with the TUDI. Thus, the DDI will provide additional future capacity than the TUDI and future traffic beyond the design year will be better serviced by the DDI.

From a safety perspective, the DDI should reduce both the overall amount of crashes as well as the severity of crashes compared to the TUDI. The TUDI has twenty-six overall conflict points, with thirteen conflict points concentrated at each of the ramp terminals. The DDI, on the other hand, only has fourteen conflict points. These conflict points are spread out through the interchange, which means that a driver only needs to navigate through one potential conflict at a time. Also, there are only two crossing conflict points in the entire DDI, one at each crossover intersection. This compares to ten crossing conflict points in the TUDI. These crossing conflicts provide more opportunity for more severe crashes.

The DDI was selected as the recommended interchange alternative for the study interchange over the TUDI, and therefore, Alternative 4 Improved - Diverging Diamond Interchange (DDI) with Continuous Flow Intersection (CFI) at Ortiz Avenue and Superstreet Intersection (SS) is recommended as the preferred alternative. Also, the CFI-DDI-SS provides acceptable arterial level of service along Colonial Boulevard which the TUDI did not provide.

The conceptual plans for both the TUDI and the CFI-DDI-SS alternatives are provided in **Appendix U**.

Table 13-1 Year 2038 Alternative Screening Matrix

BUILD ALTERNATIVE	DESCRIPTION	FEASIBLE	REASONS FOR ELIMINATION/SELECTION
1	Single Point Urban Interchange (SPUI) Approved as preferred alternative per I-75 PD&E Study (November 2002) and SIMR (8/8/2008)	No	<ul style="list-style-type: none"> • Require replacement of the recently widened I-75 bridges due to the inability to have the proper geometric curves on the ramps for the left turn movements with the existing I-75 bridge structures over Colonial Boulevard. • The ramp terminal intersection operates with comparatively higher average delay compared to that the other build alternatives. • Colonial Boulevard does not meet arterial LOS. Segment between Dynasty Drive and Forum Boulevard and between I-75 Ramps and Ortiz Avenue do not operate at an acceptable LOS in the westbound direction during AM or PM or both peak periods.
2	Enhanced Eastbound to Northbound Loop Configuration Will maintain the existing “turbo” lane along with additional improvements at ramp terminal intersections	No	<ul style="list-style-type: none"> • Require new ramp bridge over Colonial Boulevard. • Attractive option based on and lesser overall delay corresponding to acceptable level of service at the ramp terminal intersections. • Colonial Boulevard does not meet arterial LOS. Eastbound segment between Rolfes Road and I-75 SB ramps does not operate at an acceptable LOS during the AM peak period and Westbound segment between Dynasty Drive and Forum Boulevard do not operate at an acceptable LOS during both peak periods.
3	Tight Urban Diamond Interchange (TUDI) Will improve spacing between ramp terminal intersections and adjacent intersections	Yes for Interchange configuration but for arterial analysis of Colonial Boulevard does not meet LOS	<ul style="list-style-type: none"> • Does not require replacement of the recently widened I-75 bridges. • The ramp terminal intersections have the highest delay when compared to Alternative 2 and Alternative 4. During the PM peak, the NB Ramp terminal intersection has an average delay for LOS D. • Colonial Boulevard does not meet arterial LOS. Same as Alternative 2.
4	Diverging Diamond Interchange (DDI) Will improve spacing between ramp terminal intersections and adjacent intersections	Yes for Interchange configuration but for arterial analysis of Colonial Boulevard does not meet LOS	<ul style="list-style-type: none"> • Does not require replacement of the recently widened I-75 bridges. • Ramp terminal intersections operate at an average delay for level of service C. • Improve safety with reduction of conflict points. • Colonial Boulevard does not meet arterial LOS due to poor arterial performance. Eastbound segment between Rolfes Road and I-75 SB ramps does not operate at an acceptable LOS during the PM peak period and Westbound segment between Dynasty Drive and Forum Boulevard do not operate at an acceptable LOS during both peak periods.
4 Improved	Diverging Diamond Interchange (DDI) and Improve Colonial Boulevard intersections Will improve spacing between ramp terminal intersections and adjacent intersections with reconfigurations of adjacent intersections	Yes for Interchange and arterial analysis on Colonial Boulevard	<ul style="list-style-type: none"> • Additional Improvements to Alternative 4: Continuous Flow Intersection (CFI) at Ortiz Avenue, Superstreet (SS) at Forum Boulevard • With these two adjacent intersection improvements, Colonial Boulevard will achieve an acceptable arterial LOS in both directions during AM and PM peak periods and all the study intersections operate with considerably low average delay.

